1 FEBRUARY 1951 ONE SHILLING

FLIGHT and AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

This painting, reproduced by the courtesy of the No. 263 Squadron portrays their magnificent demonstration of formation aerobatics with Gloster Meteors at the 1950 R.A.F. Display at Farnborough. The Gloster Meteor is standard equipment of the Royal Air Force, the Royal Australian Air Force and the Air Forces of the Netherlands, Belgium and Denmark.

The Versatile
GLOSTER METEOR
GLOSTER AIRCRAFT CO. LTD., MEMBER OF THE HAWKER SIDDELEY GROUP

About Aluminium... 1

INTRODUCTORY

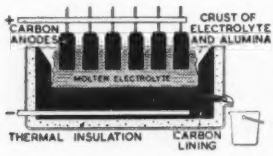
This is the first of a number of short factual reviews of those features of the metal aluminium that are relevant to its use as an engineering material. The series is intended primarily for students, to enable them to widen their acquaintance with an element that has grown, perhaps rather too quickly for the standard text books yet to have followed, to an industrial significance second only to that of steel. We hope that they may find the data worth keeping for reference when they meet aluminium, as they will ever more frequently do, in their future careers.

Extraction

Aluminium is the most abundant metal in the earth's crust. Its most useful natural form, however, is the hydrated oxides that largely compose the mineral bauxite. This does not respond to simple smelting methods, and the metal was not isolated until 1825. Thereafter, small amounts of aluminium were produced by reduction by sodium, but it remained a very costly metal. In 1886, however, a very much cheaper way of reducing aluminium oxide (alumina), by electrolysis, was discovered, and this process is the one now in use.

Briefly, the ore is first treated to produce pure alumina; this oxide is dissolved in molten cryolite and a heavy electric current is passed through the solution from carbon anodes, near the surface, to the carbon lining of the bath. The oxide is broken down electrolytically, the oxygen combining with the anodes to escape as carbon dioxide, and metallic aluminium sinks to the bottom, whence it is tapped from time to time. Little change takes place in the cryolite; the carbon anodes are consumed and have to be regularly replaced.

Four pounds of high-grade bauxite are needed to produce two of alumina, which will in turn yield one pound of aluminium of over 99% purity. Roughly 10 kWh of electricity are consumed for each pound of metal obtained from the reduction cell; this makes cheap and plentiful power essential, and the world's main reduction plants are sited on specially built hydro-electric schemes.



Electrolytic Reduction Cell

Fabrication

Of the aluminium produced, more is marketed as sheet than in any other form. Sheet rolling is not basically different from that of most other metals, and similar equipment is used: a prepared cast ingot is passed through a succession of pairs of hard steel rolls and its thickness reduced step by step to that desired. It is first rolled hot, but the final reductions are made on the cold sheet to obtain a good finish and perhaps, by work hardening, a desired degree of hardness. The production of accurately-gauged, flawless sheet and strip demands very precise and elaborate equipment and much experience.

Equal in importance is the extrusion process, by which lengths of metal of constant cross-section, solid or hollow, are made. Very high pressures are used to force hot plastic aluminium out of a container through a steel die of the required shape. This process produces, in a single operation, sections that could be made in no other way. Aluminium is the only structural metal, unless brass is so called, that can be extruded, and the variety of intricate sections possible encourages ingenious design in many products.

Seamless light-gauge tube is made by drawing down extruded thick-walled tube through hard steel dies. Rolled sections and rod are formed by passing a cast billet or heavy extruded bar through a series of shaped rolls; by drawing the rod through dies it is further reduced into wire. A principal use of rod and wire is for making rivets.

Although now accounting for a lesser volume of metal than sheet rolling or extrusion, casting and forging are practised on a large scale.

Casting was the earliest way of making things in aluminium, and was in use from the first days of the motor industry, which is still a major consumer in crankcases, pistons, and other engine parts. Sand moulds, or iron or steel "permanent" moulds (gravity dies), are used.

Forging is suitable for highly stressed but more simple parts, such as engine connecting rods or propeller blades. A piece of hot aluminium is simply hammered or pressed to shape between a pair of hard steel dies

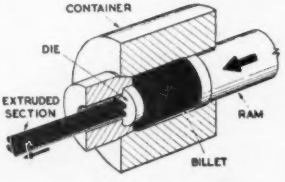
Why it is important to the engineer

The properties of aluminium are to be discussed in later articles of this series, but we should mention two of the characteristics that made aluminium worth developing, and that lie behind its wide acceptance as a primary structural material.

The first is well-known: that the specific gravity of the metal is low (2.70), about a third of that of steel. This gives it first place where lightness is sought in structures or mechanisms, for its strength, slight in the pure state, can, by alloying and by mechanical and thermal treatment be raised to equal and surpass that of structural steel.

Not, perhaps, so widely appreciated is aluminium's power of resisting damaging attack by the atmosphere. This, probably as much as low weight, has promoted its use in building for the sake of long life and freedom from recurrent painting costs. Marine conditions, widely believed to be deadly to aluminium, are in fact adequately withstood by suitable alloys, which are in use in many sea-going craft. Its reluctance to corrode, and the harmlessness of its salts, make the metal of value in the processing and packing of food.

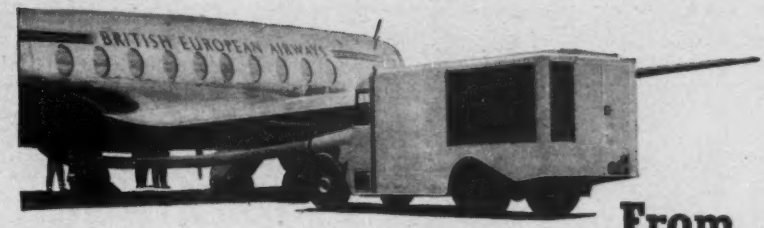
In its short life, aluminium has become established as a material useful to most branches of engineering, indispensable to some.



The Extrusion Process

The further articles in this series will deal with specific aspects of the metal and its behaviour.

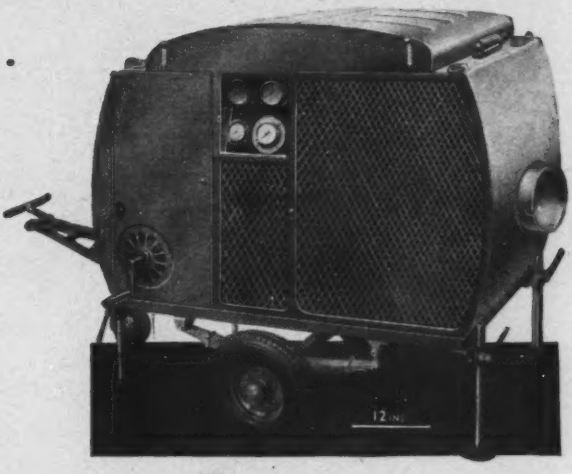
NORTHERN ALUMINIUM COMPANY LIMITED
TECHNICAL DEVELOPMENT DIVISION BANBURY, OXON



From success...

to SUCCESS...

Passengers, while awaiting take-off at tropical aerodromes, have reason to be grateful to the M.L. Air Conditioning Equipment for providing them with ample cool dry air in the cabin despite the heat outside. The Coolairvan (44 tons of refrigeration) was the first unit specifically designed for this purpose. It was shortly followed by the medium Coolair (18 tons of refrigeration). Now the Coolair Minor (2 tons of refrigeration) has been designed to cool personnel engaged on servicing aircraft, thus enabling them to work with speed and efficiency under tropical conditions. Designed to the latest Ministry of Supply specification, a contract has been placed with M.L. Aviation Company Ltd. for the Coolair Minor.



Now **The M.L. COOLAIR MINOR**

LENGTH 6' 6"
WIDTH 3' 2"

MOBILE AIR CONDITIONING UNIT

Powered by petrol engine or electric motor as required

AIR DELIVERY

400 CUBIC FT. Per Minute.

REFRIGERATION CAPACITY (Nominal)

24,000 B.T.U. Per Hour.

AMBIENT TEMP. °F	AMBIENT RELATIVE HUMIDITY	PERFORMANCE TOTAL COOLING B.T.U./HOUR	DELIVERY TEMP.°F (300C.F.M.)	DELIVERY TEMP.°F (400C.F.M.)
120°	30%	25,000	73°	78°
100°	45%	22,000	64°	69°
90°	90%	24,000	71°	75°
90°	65%	21,000	63°	68°
90°	30%	16,000	51°	55°
75°	100%	19,000	58°	62°
75°	60%	15,000	49°	53°

ML AVIATION CO., LTD.

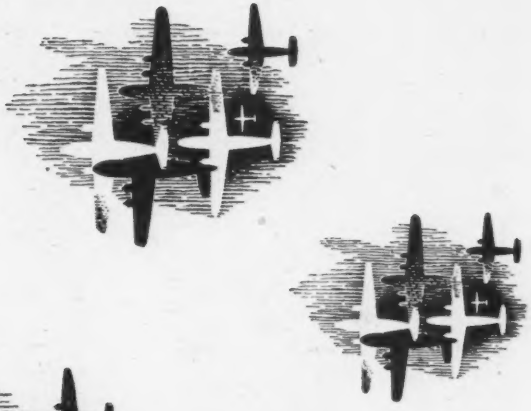
WHITE WALTHAM AERODROME, MAIDENHEAD, BERKSHIRE, ENGLAND

Telephone : Littlewick Green 248

Telegrams : "Emelair" White Waltham

A

The Christlea Skyjeep
G-AKVS
BRITAIN'S LATEST LIGHT AIRCRAFT
AND WINNER OF THE 1950 GOODYEAR TROPHY!
powered by a Cirrus Major III



In Aviation, as well as in the broad field of telecommunication engineering, progress has followed STANDARD in the development and production of control and communication systems and equipment . . . anticipating the needs of Industry, Commerce and Transport . . . ready to meet their great, and rapidly multiplying demands.

In aircraft, including the *Brabazon* and the *Comet*, the *Viscount* and the *Hermes*, the *Ambassador* and the *Apollo*, STANDARD radio equipment is helping to extend Britain's lead in aeronautical enterprise.

Standard systems, equipment and components designed and produced for the aeronautical industry, include :

M.F., H.F. and V.H.F. air and ground radio equipment
Instrument Landing System receivers
Precision approach Radar equipment (G.C.A.)
Direction Finding equipment
Airfield Lighting Remote Control Systems
Starter Trucks for Gas Turbine engines
Lightweight Selenium Rectifiers for Aircraft
Valves and Miniature Relays for Aircraft Equipment
Aircraft Cables.

Standard *engineers are always available for consultation with aircraft designers and technicians.*

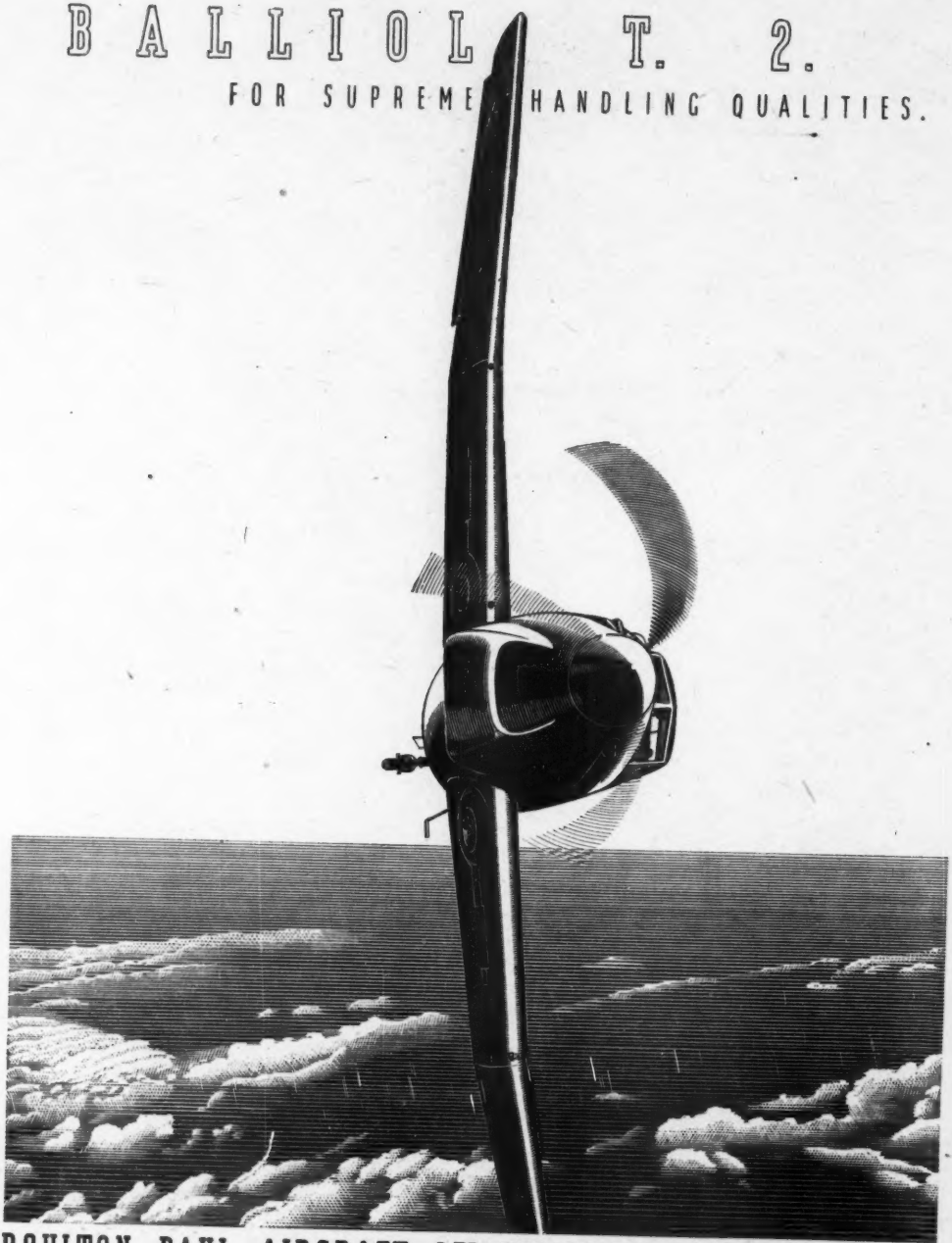
Standard Telephones and Cables Limited

Registered Office : Connaught House, Aldwych, London, W.C.2

RADIO DIVISION · OAKLEIGH ROAD · NEW SOUTHGATE · LONDON · N.11

BALLIOL T. 2.

FOR SUPREME HANDLING QUALITIES.



BOULTON PAUL AIRCRAFT LTD. WOLVERHAMPTON, ENGLAND

QUALITY · ACCURACY · SPEED · LONG LIFE

GROUND THREAD TAPS

to precision limits in 18% Tungsten High Speed Steel or best quality Carbon Steel.

Standard Hand and Machine Taps to Grade I tolerances and Standard Machine Nut Taps available from stock.

All your requirements can be met for Pearns Taps, Tapper Taps (straight or bent shanks), Boiler Stay Taps, Taper Thread Taps, Shell Taps, Acme Thread Taps and all types of special machine taps with straight or spiral flutes.

Range :—16 B.A. to 6in. diameter.
Pitch 0.3 mm. to 2 t.p.i.
Thread Forms—Whitworth, B.A., Metric, U.S.S., Unified, Acme, C.E.I.

TWIST DRILLS. REAMERS.
TAPS.
MILLING CUTTERS.
LATHE TOOLS. CHASER DIES.
" MITIA " CARBIDE CUTTING TOOLS.
" MITIA " CARBIDE SAWS.
SEGMENTAL SAWS.
SAWS FOR ALL PURPOSES.
FILES AND RASPS. HACKSAWS.
" HARDOMETER " HARDNESS TESTING MACHINE.
TWIST DRILL POINT SHARPENING MACHINE.
" CRYPTO ATLAS " BANDSAWING MACHINE.
" MITIA " CARBIDE SAW SHARPENING MACHINE.
AND ALL OTHER TYPES OF ENGINEERS' CUTTING TOOLS.

F. B.
FIRTH BROWN
TOOLS LTD. SHEFFIELD

AIR RESCUE AND SURVIVAL EQUIPMENT

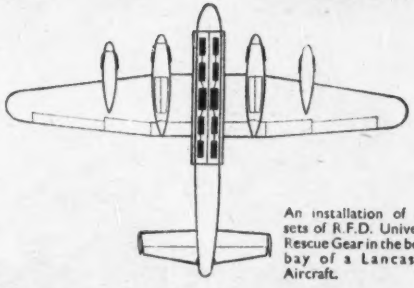
MATÉRIEL DE SAUVETAGE POUR L'AVIATION ET LA MARINE

EQUIPO DE SALVAMENTO AERO-MARITIMO

An Avro Lancaster, having dropped her first set of R.F.D. Universal Rescue Gear, circles as the survivors board the Rescue Dinghy. A second set may then be dropped. The R.F.D. Co. Ltd. manufacture rescue gear for use at sea or upon land, in arctic, temperate or tropical zones, which can be modified for installation in all types of aircraft.

Un Avro Lancaster, ayant lancé son premier jeu de Matériel de Sauvetage Universel R.F.D., décrit des cercles au-dessus pendant que les survivants montent dans le petit canot de sauvetage. L'avion peut alors lancer un second jeu de matériel. La R.F.D. Co. Ltd. fabrique un matériel de sauvetage pouvant s'employer en mer ou sur terre, dans les régions arctiques, tempérées ou tropicales, et susceptible de se modifier en vue de son installation sur avions de tous types.

Después de haber lanzado su primer Equipo R.F.D. de Salvamento Universal, un Avro Lancaster va circulando mientras los sobrevivientes abordan el Bote Neumático Salvavidas. Entonces se puede lanzar un segundo equipo. La R.F.D. Co. Ltd., fabrica equipos de salvamento para su empleo en el mar o bien por tierra en las regiones árticas, templadas o tropicales, equipos que pueden modificarse para ser instalados a bordo de todos tipos de aviones.



An installation of two sets of R.F.D. Universal Rescue Gear in the bomb bay of a Lancaster Aircraft.

CONTRACTORS TO BRITISH AND FOREIGN GOVERNMENTS
A.I.D. Approved Certificate No. 714352/26

R·F·D LTD COMPANY

DESIGNERS AND MANUFACTURERS OF INFLATABLE EQUIPMENT SINCE 1920
A.R.B. Approval Certificate No: A1/1708/44

CATTESHALL LANE. GODALMING, SURREY. PHONE: 1441. CABLES: AIRSHIPS

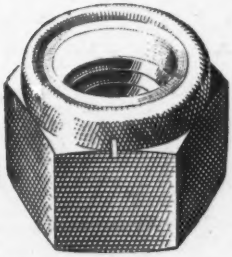
nothing rattles the NYLOC*

Regd.

it has a NYLON insert . . . . .

The Nyloc gets a tremendous grip on a bolt and keeps it under all conditions, including vibrations. It owes this stability to the insert — a special nylon which is quite unaffected by temperature extremes, or by immersion in oil, petrol, kerosene, paraffin and boiling water. Once it's on a bolt it's there for keeps — unless *you* move it.

*Approved by the Royal Aircraft Establishment, Farnborough, for use in all types of aircraft.

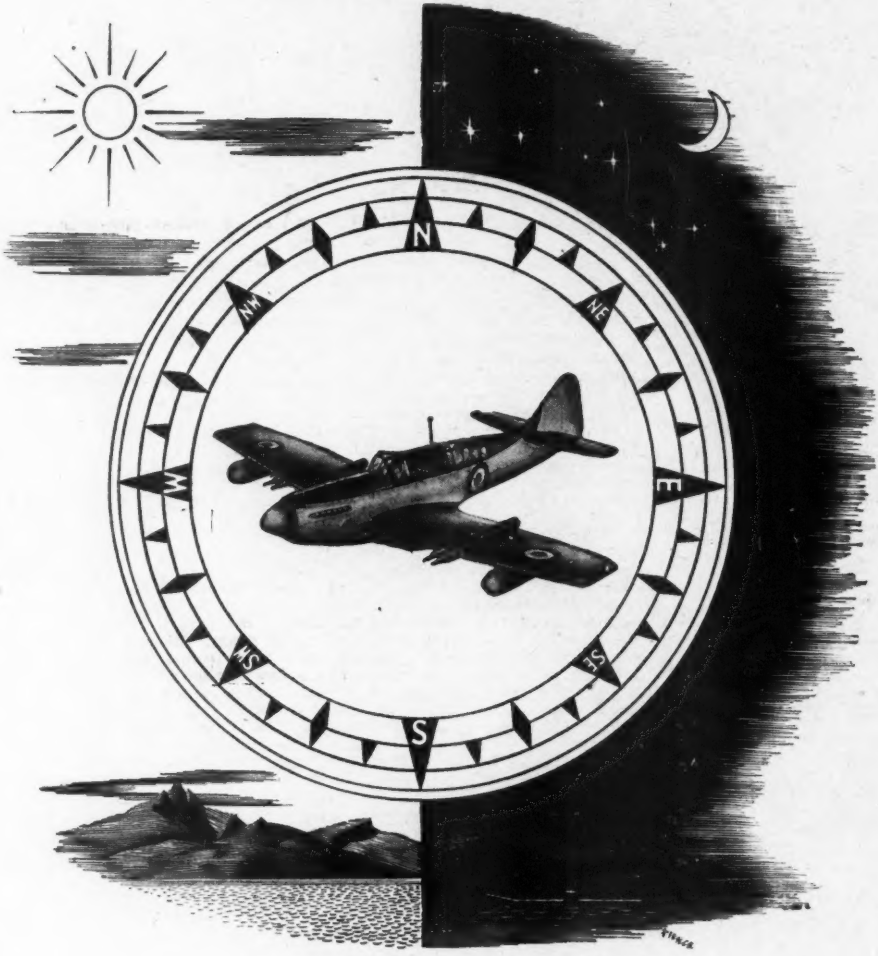


SIMMONDS NYLOC SELF-LOCKING NUT

Enquiries to: SIMMONDS AEROCESSORIES LIMITED, BYRON HOUSE, 7-8-9, ST. JAMES'S STREET, LONDON, S.W.1
Head Office and Works: TREFOREST GLAMORGAN. *Also* BIRMINGHAM · STOCKHOLM AND MELBOURNE

40A

Fully equipped for all day and night operations



Cleared for all climates in the world

THE VERSATILE *'Firefly'*

The chosen Anti-Submarine Weapon of four Navies—Land or Carrier Based

THE FAIREY AVIATION CO., LTD., HAYES, MIDDLESEX

FLIGHT
and
AIRCRAFT ENGINEER

First Aeronautical Weekly in the World

Founded 1909

No. 2193. Vol. LIX. THURSDAY, 1 FEBRUARY 1951

EDITORIAL DIRECTOR
G. GEOFFREY SMITH, M.B.E.

EDITOR
MAURICE A. SMITH, D.F.C.

ASSISTANT EDITOR
H. F. KING, M.B.E.

TECHNICAL EDITOR
C. B. BAILEY-WATSON, B.A.

ART EDITOR
JOHN YOXALL

Editorial, Advertising and Publishing Offices :

DORSET HOUSE,
STAMFORD STREET,
LONDON, S.E.1.

Telegrams : Flightpress, Sedist, London.
Telephone : Waterloo 3333 (60 lines).

Branch Offices :

COVENTRY
8-10, Corporation Street.
Telegrams : Autocar, Coventry.
Telephone : Coventry 5210.

BIRMINGHAM, 2.
King Edward House,
New Street.
Telegrams : Autopress, Birmingham.
Telephone : Midland 7191 (7 lines).

MANCHESTER 3.
260, Deansgate.
Telegrams : Iliffe, Manchester.
Telephone : Blackfriars 4412 (3 lines).
Deansgate 3595 (2 lines).

GLASGOW, C.2.
26b, Renfield Street.
Telegrams : Iliffe, Glasgow.
Telephone : Central 4857.

SUBSCRIPTION RATES
Home and Overseas : Twelve months £3 3s. 0d. U.S.A. and Canada, $10.00
BY AIR : To Canada and U.S.A., six months, $16.

In this issue:

Aiglet in the Air - - 118
To Dublin's Fair City - 122
Record Review - - 127
Shapes and Sizes - - 134
Aspinl - - - - - 135
Vibrations in Helicopters 138

We Say Again . . .

VERY rightly, the views of Mr. T. O. M. Sopwith, aviation pioneer and chairman of the vast and influential Hawker Siddeley Group, have received wide publicity following his speech at the annual general meeting. His fears for the strength of the R.A.F. echo those expressed earlier by Air Chief Marshal Sir Guy Garrod, chairman of the Air League. For months past *Flight*, whose representatives are in an almost unique position to obtain a cross-sectional view of the industry and the Services, has been hammering away regularly at the country's lack of preparedness and of production orders for military aircraft. A glance at some condensed extracts from leading articles printed during 1950—just one year—makes this very apparent:—

January 26th: "There is no necessity for alarm in respect of the quality of British aircraft—only for the speed with which the new types are introduced into service . . . we should remember our military obligations . . . all-weather fighters are urgently required." *February 16th:* "There are grounds for real concern not only over curtailment of existing contracts but at the dearth of new orders . . . and lest the tempo of the aircraft industry be allowed to slow down." *March 16th:* "It is to be hoped that more tangible evidence of the results of earlier research programmes will be apparent in all branches of defence in the coming year." *March 30th:* ". . . inability to match the latest Russian fighters in speed or numbers." *April 20th:* "We view with alarm the material deficiencies apparent in the R.A.F. . . . and its shortage of skilled tradesmen." *April 27th:* "British bombers needed . . . absence causing anxiety." *July 6th* (in our R.A.F. special number, which appeared shortly after the start of the Korean hostilities): ". . . Britain's air strength is too little and plans for its increase may mature too late." *July 27th:* "This is no time for half measures . . . the strength of the aircraft industry has been reduced below danger point by lack of orders." *September 9th:* "Excellent prototypes . . . but no orders." *September 21st:* "The country must be better prepared . . . at the start of another war there will be no breathing space." *October 5th:* "Orders for Naval types are urgently awaited . . . protracted indecision must lead to dangerous unbalance." *November 23rd:* "Fast fighters are lacking . . . no adoption of any known type of British swept-wing fighter." *December 21st:* "There is a continued lack of large jet bombers, and fighters in certain classes . . . we hope that weighty decisions of recent months will not prove to have been too late nor scale of defences too unrealistic."

Re-reading these and many other references, we feel constrained almost to apologize for such reiteration and for our persistence in this drop-of-water-wearing-away-a-stone policy. Yet we believe that the great majority of our readers concur and that they, too, make their feelings known in the right quarters whenever possible. Being politically unbiased *Flight* can only express the hope that the occupants of these "right quarters" are doing their best, inadequate though the results have been to date.

Meanwhile, maintaining a policy which calls for even more urgent pursuance than it did a year ago, we place our weight squarely behind that of the Hawker Siddeley chairman (with no fear, of course, that we might personally be asked to produce any aircraft) in demanding an active recognition of the country's unpreparedness; a speeding-up of many vital development contracts; and, above all, the immediate placing of more orders—if need be, and where there is adequate background, off the drawing board.

A kindred topic, on which many opinions have been expressed, is that of the reported intention to deliver several hundred American F-86 fighters to the R.A.F. Our feelings in the matter are much the same as they were when B-29s were taken over and, indeed, when Constellations, Stratocruisers and Argonauts were bought for our airline Corporations. We are thankful to have these excellent aircraft to fill dangerous gaps in our equipment, and are well aware of why the deficiencies have arisen. But there is still cause for real regret that our own most capable industry was not enabled to cater for all our needs.

Mr. Menzies, during his recent visit, said it would be a calamity for the British People to lose their decent pride in themselves and in their achievements. If we may judge from a Detroit report quoted by a well-known daily paper in its leading article, we are also in danger of losing the valued respect of many Americans by permitting ourselves to become too Americanized and too much under American military control.

AIGLET

In the Air

No. 39 of the Series: Flying Auster's Latest Civil Variant : Suitability for Operation Overseas

By THE EDITOR

IN discussing the variety of light aircraft which have been built by the Auster company we are reminded of Ogden Nash's wise child, Pendleton Birdsong, who said that not only was he "the wise child that knew its own father," but also that he was "the child who was father of the man." From that he went on to deduce that he was his own father, and that upon subsequently becoming a father he wouldn't know himself.

Just which basic Auster type the Aiglet would acknowledge as father must puzzle many a pilot, but the four photographs on page 126 may reveal some features and family likenesses which will help in future deliberations.

The Aiglet is, of course, related to several of the earlier Auster variants, and for its particular type of work and intended theatre of operations is in several respects superior to any of the others. Of especial interest in these times of rising costs is its low selling price of £1,150—a figure possible of attainment only as the result of a long civil and military development line and considerable care and ingenuity on the part of the designer and manufacturers. It is intended particularly for the private pilot or club member overseas, where climatic conditions and terrain call for the power of a Gipsy Major translated into short take-off and good climb at high altitudes and temperatures, plus a speed comfortably in excess of 100 m.p.h. In addition to these performance characteristics, simplicity and reliability are essentials in countries where servicing facilities are few and expensive. The Aiglet airframe inherits many good features from the well-proved Autocrat, and boasts the benefits bestowed by a 130 h.p. Gipsy Major I engine with 1,500 hr overhaul period.

Before describing impressions during a brief spell at the controls of the Aiglet, enjoyed recently during a local clearance in an otherwise widespread clamp, a few further words of description may be added. First, it should be made clear that the Aiglet is a three-seater into which a small, fourth person may be packed, provided that the rear bench seat is not loaded in excess of 200 lb. If a full four-seater is required, the Autocar would be the Auster type for the job.

For once, in the Aiglet, a light aircraft has been built with an excess of power for normal load, near-sea-level operation in temperate climates; but if economy is not of prime importance, the lively performance is welcome on all occasions. Normally, at home, the familiar Autocrat with 100 h.p. Cirrus Minor is the sound economical three-seater offered by the company. Also in the civil range, the Gipsy-Major-engined J.5 is recommended for crop dusting and similar duties because of its strengthened airframe and consequent authorization for higher all-up weight.

All the well-known extras are approved and can be fitted to the Aiglet which is, however, complete with all essentials at the price quoted above. Standard extras include: radio;

Illustrated by "Flight" Photographs

The Aiglet has a number of appealing characteristics, including ease and safety of handling at very low speeds. Here the aircraft responds immediately in a practice baulked landing after touching down with full flap lowered.

wind-driven generator; sunblinds; long-range belly tank (13½ gall); blind-flying panel; silencer; cross-wind landing gear; seeding, dusting or spraying equipment; and metal airscrew. The last-named, together with complete metal-spraying of all metal airframe units (specified at the time of ordering) is recommended for tropical use—these two items cost under £100 extra. Magnetic compass, vynide upholstery and dual controls are standard fitments.

According to the distances involved, crating, transport, shipping and insurance to countries such as Africa, India or Australia costs between £200 and £300.

There will, we believe, be occasions when larger-section tyres will be called for on overseas orders. For years past there has been a tendency to fit too-small tyres to British aircraft, even for home usage. The Gemini (3,000 lb a.u.w., with tyres the same size as the Auster) is a particular offender in this respect. It may be that no suitable larger tyres are available for Austers, although some of the first doughnut tyres ever seen on aircraft were British. Now it seems to be left to machines such as the Piper Cub to keep this practical fashion going.

At the Controls.—Although I am no lover of heel brakes it must be admitted that the Aiglet responded smoothly and quickly to a touch on one or other of the heel-operated pedals as I taxied out. In any case, with the aid of the large rudder the machine taxies well without the use of brakes. The Gipsy engine installation does not look much larger than that of the Cirrus Minor, and cabin view is unaffected.

For take-off with full normal fuel tank, but long-range tank empty, I was advised to use the first flap-lever setting (take-off and manœuvre) to obtain the best results; and certainly, with negligible wind blowing, the Aiglet lost no time in leaving the ground when the throttle was opened. Autocrat owners would find the directional control during the early part of the run more positive, and there seems to be an improvement in the fore-and-aft control sensitivity at the same time—the weight of the Major may have something to do with this. Moreover, the quicker take-off much reduces the period of possible hopping and bouncing—tendencies more particularly noticeable on uneven fields in the case of the Autocrat. The overall effect is to give a feeling of greater stability and confidence to the pilot. (That is, perhaps, the English translation of the statement in the Auster brochure, "New harmony-designed tail gives rock-firm ride.")

At the reduced weight the climb of the Aiglet was rather better than 900 ft/min at about 65 m.p.h. Raising the split-type flaps on the climb made very little difference to trim, nor was there any appreciable sink. The rudder trimmer is much the same as on the Autocrat—a winder above the pilot—and very sensitive.

In most places the cloud-base was 500ft above ground level, and visibility was patchy, averaging about 2,000 yards. In spite of these poor conditions, the new type of aircraft, and some weeks without flying practice, I quickly settled down and flew with more confidence and accuracy than would have been the case with many other light types. Directional stability and response to controls were much improved by comparison with some earlier types and, for example, accurate medium turns could be made with feet off the rudder controls.

Cruising at 2,150 r.p.m. and about 108 m.p.h. I.A.S., the aircraft could be trimmed to fly hands-off for long periods. The noise from the exhaust and from the buzz and rattle of panels and equipment has been much reduced by, respectively, the silencer and good fitting and finish of cabin details.

Having devoted several minutes to photography, some results of which are published herewith, there was little time to do more than stall, approach, overshoot, and then make a final circuit and landing before mist again blanketed out the field. The stall was straight and most gentle, and recovery was almost instantaneous when the stick was centralized or eased forward. It came at about 38 m.p.h. I.A.S. When stalled with flap down the aircraft proved to be equally docile, but the air speed was even lower.

For a trial baulked landing the Aiglet was brought in with full flap and three-pointed on an uphill section of the Auster field at Rearsby. The throttle was then banged open and the aircraft rose lift-like with full flap and continued to climb at about 50 m.p.h. Again, the virtual absence of sink was noted as the flap was raised. By this time I was also getting the knack of raising and lowering flap without undue effort. The Auster flap-operating system has the important virtue of simplicity, but needs getting used to before movement of the lever becomes a more or less unconscious reaction when the need for flap arises. Fancy systems, we know, lead to expense and unserviceability.

For approaching and landing, the gliding speed limits can be quite wide—anything between 60 and 80 m.p.h. would usually be acceptable. A comfortable over-the-hedge speed would be 60 m.p.h., and the aircraft rounds out very nicely at about 45-50 m.p.h. As in the case of the take-off, so with the landing there is a pleasant feeling of stability, even solidarity, in advance of that found in earlier Austers. Springing and brakes also seem well matched to the aircraft's requirements.

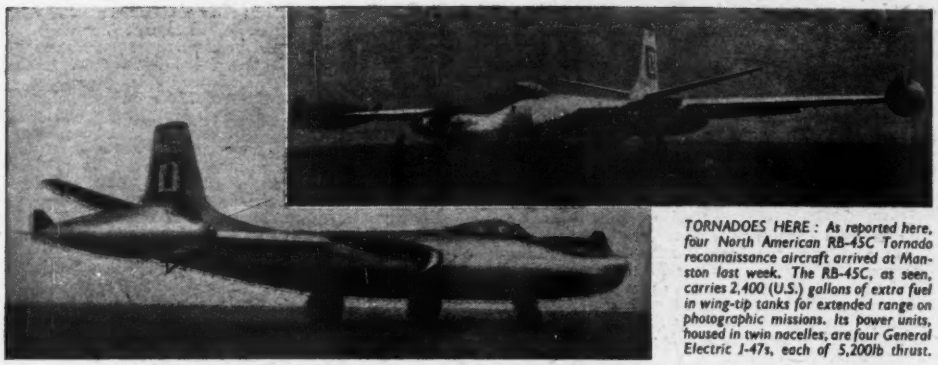
There is no doubt that the Aiglet is an appealing little aircraft capable of handling a variety of everyday flying jobs with efficiency and safety. Its price makes it strictly competitive with products for similar duties offered anywhere in the world, and its overseas prospects should be excellent. We hope, in better weather conditions, to further our acquaintance with this latest Auster type.

An unusual angle for a photograph, dictated in this instance by low cloud and poor visibility. The pilot (the author) was able to keep the photographic machine in view by looking over the wing.

AUSTER AIGLET

(130 h.p. de Havilland Gipsy Major 1)

Span	34ft (11 m)
Length	23ft 3in (7 m)
Height	6ft 6in (2 m)
Wing area	185 sq ft (17 m²)
Total weight empty	1,215 lb (551 kg)
Max all-up weight	2,000 lb (907 kg)
Performance at maximum weight	
Take-off run	135 yd (123 m)
Landing run	125 yd (114 m)
Rate of climb at s.l.	710 ft/min (3.6 m/sec)
Cruising speed	105 m.p.h. I.A.S. (169 km/hr)
Maximum speed	126 m.p.h. I.A.S. (203 km/hr)
Stalling speed (full flap, engine off)	28 m.p.h. I.A.S. (45 km/hr)
Cruising Range, still air :	
Normal fuel tankage (15 gall)	245 miles (394 km)
Normal and long-range tanks (28½ gall)	465 miles (748 km)



TORNADOES HERE: As reported here, four North American RB-45C Tornado reconnaissance aircraft arrived at Manston last week. The RB-45C, as seen, carries 2,400 (U.S.) gallons of extra fuel in wing-tip tanks for extended range on photographic missions. Its power units, housed in twin nacelles, are four General Electric J-47s, each of 5,200lb thrust.

HERE and THERE

National Air Races, 1951

ENTRY forms and the general regulations for the Festival of Britain, 1951 National Air Races are now available from the Royal Aero Club, 119, Piccadilly, London, W.1. The Races, comprising seven events, will be held at Hatfield on Saturday, June 23rd.

Hermes in Pursuit

AT St. Albans last week, a private pilot was fined £20 for flying his Rapide inside the boundary of Radlett airfield at below 2,000ft. The incident occurred while a Hermes IV was on final approach after a test flight. S/L. H. G. Hazelden, chief test pilot of Handley Page, Ltd., said in evidence that he regained height and chased the Rapide, noting its registration letters after seven miles.

Tornadoes at Manston

FOUR North American RB-45C Tornado reconnaissance aircraft, two of which are shown on this page, landed at Manston last week after flying the Atlantic "by a Northern route," presumably in stages. Wing-tip tanks, each of 1,200 U.S. gallons capacity, give the RB-45C a tankage of nearly 7,000 gall.

The RB-45C is a development of the B-45A, the first jet bomber to go into squadron service, of which 96 were built. Some are being converted as high-speed target tugs. Four General Electric J-47 turbojets, each of 5,200lb thrust, give a speed of over 550 m.p.h. Service ceiling is more than 40,000ft.

Also resident at Manston now, under the rotational training programme of the U.S.A.F. Strategic Air Command, is a Fighter-Escort Wing of Republic F-84 Thunderjets.

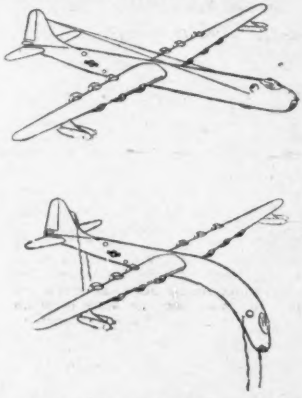
Long-range Air Power

REPRINTS of his recent article "Maginot Mentality" have been sent by Marshal of the R.A.F. Lord Trenchard to a number of R.A.F. command headquarters. In the article, Lord Trenchard expressed belief that the maintenance of overseas bases was causing too much expenditure of Western defensive effort. He thought that we should concentrate on building up a large home-based fleet of long-range bombers and fighters.

Lord Trenchard's views were supported in a recent letter to *The Times* by Air Marshal Sir Patrick Playfair (ret.), who wrote "However fraught with encouragement may seem the process of 'showing the flag' of our air power in foreign parts, in times of adversity this may assume the characteristics of a boomerang. This reflection occurred forcibly to me in France in 1940, when, as commander of the Advanced Air Striking Force, it became my duty to conduct our withdrawal to the ports."

Modellers' Festival

EXTENSIVE model-aircraft contests are being arranged by the Society of Model Aeronautical Engineers to coincide with the 1951 Festival of Britain. The principal event will be the National Model Flying Championships (July 21st) at Wembley Stadium in London; it will include speed trials, aerobatics and team races. The great size of the Stadium will permit up to six events to take place simultaneously, and its banked terraces should provide the audience with an excellent view.



AMERICAN TWANG, echoed (with apologies in all directions) by reader D. Howard, who has been studying the radio aerial set-up of the B-36.

Buttoned Up

THE long-term agreement between Armstrong Siddeley Motors, Ltd., and the Curtiss-Wright Aeronautical Corporation has been formally signed by both companies and approved by the British Government. The agreement permits American manufacture of the Sapphire, Python, Mamba and Double Mamba.

Thin-red-lineshoot

DURING the last three years of the war, the Luftwaffe acquired 80,000 aircraft, of which the Russians shot down 75,000—according to a recent article by Stalin's son Vassily, who is a lieutenant-general of aviation in the Red Army. British, American and German airmen, he said, gave up combat when their ammunition ran out; Russian pilots, in similar circumstances, rammed 200 German aircraft. The war had shown Soviet pilots to be the moral and military superiors of other airmen.

Sapphires in Demand

PRODUCTION versions of the Martin XB-51, at present powered by three General Electric J-47 turbojets, may be provided with American-built Armstrong Siddeley Sapphires, should the U.S.A.F. order this tactical-support bomber. The 7,200-lb-thrust British unit is also likely to be adopted for the swept-wing Republic F-84F, a Thunderjet-development, which has been ordered in quantity. According to *Aviation Week*, "Several U.S. manufacturers now using J-47 and J-35 engines in their jet fighters are seriously considering the additional power which the almost interchangeable Sapphire gives."

Flight Log in Production

THE Flight Log of the Decca Navigator system—the subject of an article in the January 11th issue of *Flight*—is now going into quantity production. The essence of the development is a display head whereby map presentation is given to the pilot, the aircraft's position being uninterruptedly and progressively drawn on the map by a stylus. Maps of various scales are printed on a roll of paper, and the appropriate map for *en route* naviga-

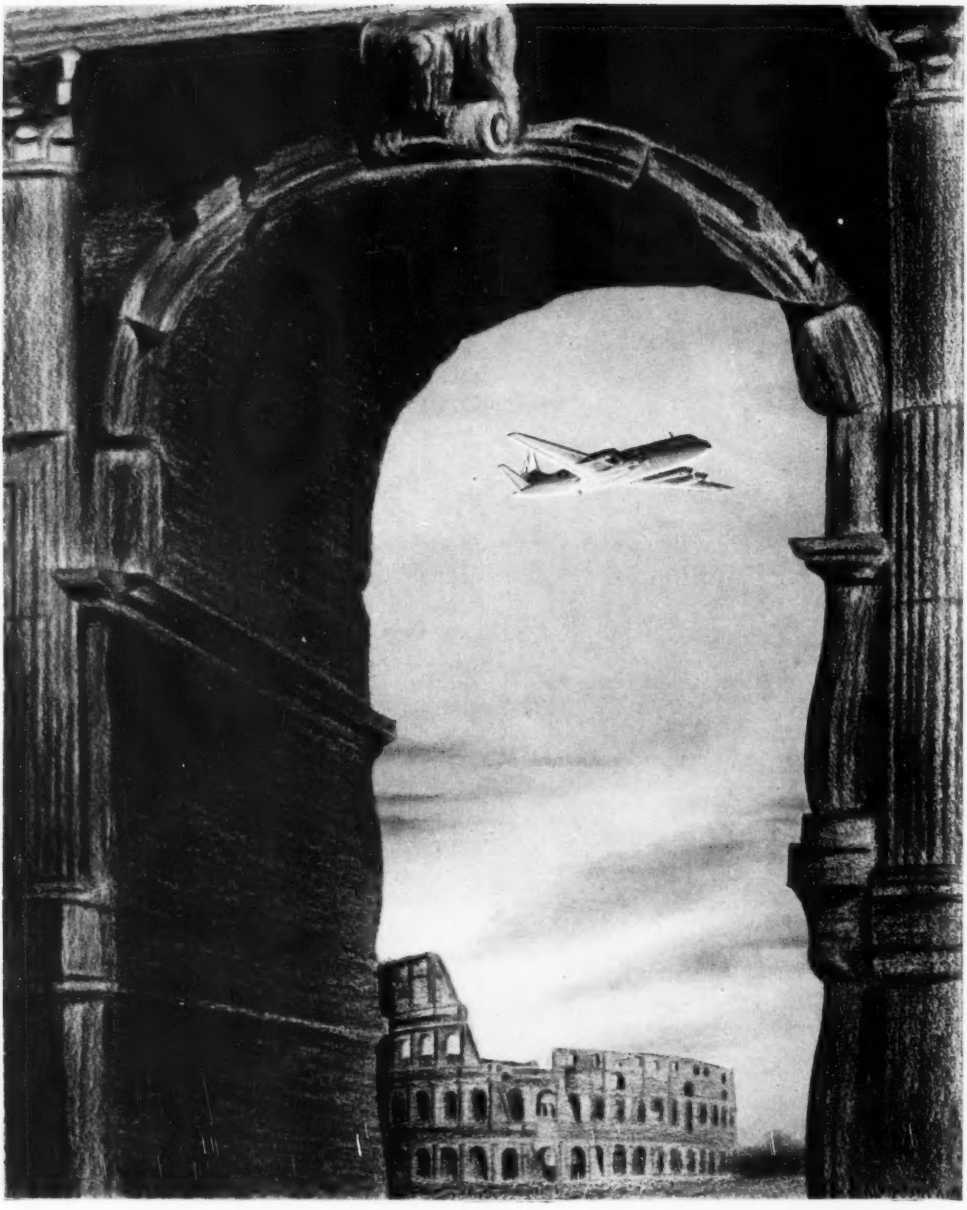
CROP SPRAYING

SURVEY WORK

CONNAISSANCE

The general capabilities of the helicopter

"Bristol"



THE VICKERS VISCOUNT (FOUR ROLLS-ROYCE DART PROPELLER-TURBINES)

The Viscount will bring quicker, safer and smoother flight between the great cities of the world — and a standard of luxury and reliability so far unknown in air travel.

VICKERS-ARMSTRONGS LIMITED, VICKERS HOUSE, BROADWAY, LONDON, SW1.

AT92

SERIES PRODUCTION : Awaiting delivery at Moreton Valence are Meteors for training, interception, tactical reconnaissance and high-altitude reconnaissance—mark-numbered, respectively, 7, 8, 9 and 10. Two of the Meteor 8s bear the insignia of Denmark, the first foreign nation to receive this version. Also in production is the Mk. 11 night fighter—built by Armstrong Whitworth.

HERE AND THERE . . .

tion, control-zone flying, or airfield approach, is instantly available by pressing a button.

Situations Vacant

ACCORDING to the Canadian Minister of Labour, the Dominion's increased need for skilled aircraft workers will be partly met by immigration from the United Kingdom. British workers, he said, would not be recruited, however, unless they could be spared.

For Air Ambulances

AN electric lift, weighing 140lb, has been developed by the Douglas Aircraft Company for loading and unloading patients in C-54 transports used as ambulances. Capable of lifting two patients or a 500lb cargo-load, the lift is easily stowed inside the aircraft and can be put into operation within a minute.

Quick Work

AT North Perry Field, Miami, on January 3rd, Mrs. Jeanne Volz was given her first flying lesson. The next morning, after 6 hours 45 minutes of dual instruction, she made her first solo flight. Her only previous flying experience was as an airline passenger. Although not a record, such speed of training speaks well for the docility of modern light aircraft—in this case a Piper PA-22 Tri-Pacer. Simplifying features of the Tri-Pacer are its nosewheel undercarriage and interconnection of rudder and ailerons.

OFF TO THE STATES : Pictured with his wife at London Airport is Trevor Wade of Hawker's, who is the first to visit America under the new Anglo-American exchange scheme for test pilots. He is expected to sample six jet fighters, starting with the Grumman Panther.

D 1

Beware of Imitations

A CERTAIN American aviation journal, showing marked lack of originality, has recently adopted the name *Flight*. Despite the adage, we are not flattered.

R.Ae.C. Film-show Cancelled

THE film *Campaigning in Korea* will not now be seen by R.Ae.C. members on February 6th, because Mr. William Courtenay, who was to have shown it, is shortly returning to Korea. The next film evening at Londonderry House will accordingly be on March 6th, when Mr. Colin Cooper will show *Helicopter Activities*.

U.S.A.F. Expansion

AS part of the plan to increase the strength of the U.S.A.F. to 1,000,000 men as soon as possible, about 150,000 members of the Air National Guard and other reserve units are to be recalled to active service. They will be summoned between March 1st and May 15th. Latest plans for expanding the U.S.A.F. envisage a total of 100 groups—300 squadrons—by early 1953.

Quote

"THE English are forging ahead of the Americans . . . in moving pictures, automobiles, jet engines, and now airliners. . . . Let us take a look at the Vickers-Armstrongs Viscount. It has vibrationless turboprop engines in the trimmest nacelles this side of Hollywood. The fuel tanks are of the crash-proof bag type. The wings and the tail are de-iced by hot air which is obtained from the waste heat of the engine exhausts by means of heat-exchangers."—Hy Sheridan, columnist and American Airlines captain, in the February issue of *Flying*.

NEWS IN BRIEF

THE January edition of *Transport Goods Guide* (published twice yearly by Associated Iliffe Press) will be of special interest to transport users and operators: the main feature is a "Transport Services A.B.C." It is obtainable at 2s 6d (including postage) from Iliffe and Sons, Ltd., Stamford Street, London, S.E.1.

* * *

Mr. C. H. Dolphin, M.I.A.M.A., has recently retired from the post of publicity manager to the English Steel Corporation, Ltd., and the Darlington Forge, Ltd. He entered the steel industry in 1907.

* * *

The doors of the "Brabazon hangar" are among the structures illustrated in a new publication by the Aluminium Development Association (33, Grosvenor Street, London, W.1), *The Use of Aluminium Alloys in Structural Engineering*.

* * *

It is reported that good test and service results have been obtained from Nevelin rectifier equipment installed by the Bristol Aeroplane Co., Ltd., for gas-turbine starting on test-beds. Stated to have been designed and built in ten weeks, the apparatus had to conform to special requirements of unusually low voltage regulation and a limited floor-loading area.

The annual staff festival of John Wright and Sons (Veneers), Ltd., held recently in London, also marked the completion of 21 years' service with the firm by Mr. L. A. W. Jenkins, joint managing director. A presentation was made to him by his father, Mr. L. C. W. Jenkins (chairman), whose association is one of 49 years.

* * *

The Hawker Siddeley Group announce that Mr. P. H. Davy, O.B.E., their regional executive for India and the Far East, will in future negotiate business on behalf of A. V. Roe, A. V. Roe Canada, and Armstrong Whitworth Aircraft. These three members of the Group were formerly represented in India by W/C. R. Vaughan-Fowler. Mr. Davy's headquarters are at present at "Hillside," Palace Road, Bangalore.

* * *

Since the formation of Magnesium Elektron, Ltd., in 1935, the founder company F. A. Hughes and Co., Ltd., have been sole sales concessionaires for all their products. With effect from to-day, February 1st, Magnesium Elektron will sell direct to customers all products except anodes for cathodic protection. Enquiries should be addressed to them at Lumms Lane, Clifton Junction, near Manchester.

TO DUBLIN'S FAIR CITY

Aer Lingus and Smiths Instruments Entertain: B.E.A.'s First Pionair Sampled

"Flight" photograph.

The Pionair posed before the impressive terminal at Collinstown, Dublin.

NOW that the world's air transport industry has reached its present vast proportions, inaugural flights have become an almost daily occurrence. It is rarely, however, that such an event offers an opportunity to, so to speak, kill four birds with one stone. Wednesday, January 24th, saw the introduction into commercial service of B.E.A.'s first Pionair, and the machine was chartered by Smiths Aircraft Instruments, Ltd., to carry 20 members of the Committee of Purchasers of Aviation Materials from Northolt to Dublin. Here, as the guests of Smiths and Aer Lingus, they met to discuss methods by which aircraft materials and equipment can be exchanged between European airlines without the necessity for spending dollars on replacements from the United States.

As described in *Flight* of January 18th, the Pionair's cockpit has been extensively modified, and many of its new instruments have been manufactured by Smiths. Thus, in addition to playing their part in acting as hosts to the representatives of Europe's major airlines—a task which they performed most competently—the company was able to give a practical demonstration of how dollar-saving can be effected by installing British instruments in aircraft of foreign manufacture.

On the occasion of its first money-earning flight for B.E.A., the Pionair was also demonstrated at Dublin before officials of Aer Lingus, who at this time are probably becoming interested in the possibility of similar treatment for their own hard-worked DC-3s. (The chairman of B.E.A., Lord Douglas of Kirtleside, arrived at Collinstown on Thursday afternoon to confer with the management of Aer Lingus on this question.)

The "fourth bird" was claimed by the Pionair itself, for whose passenger-pleasing qualities all on board showed unbounded enthusiasm. Particularly noticeable to those who flew in her—a member of the staff of *Flight* was among them—were the reduced noise-level in the main cabin, the greatly improved standard of comfort which has been attained by fitting head-rests to all seats, and the general impression of restful spaciousness which normally is found only in the more roomy and more luxuriously appointed cabins of four-engined airliners.

"Flight" photograph.

Having planned a highly successful trip, Mr. L. Morgan (general manager of Smiths Aviation Division), and Mr. G. T. Perkins (technical sales manager), right, have just cause for jocularity on the return flight.

Pilots, also, were especially pleased with the new cockpit layout; the efficiency of the two-crew conversion is demonstrated by the fact that, while the cockpit itself has room enough for two pilots, three crew members undoubtedly constitute a crowd.

After a social preamble to the business in hand on Wednesday night, the airline representatives met the following day to discuss their intricate supply problems. At the conference, Smiths Aircraft Instruments, Ltd., presented a new brochure entitled *British Replacement Aircraft Instruments for American Aircraft*, which gave full details of Smith and Kelvin instruments, and included also a brief statement on the installation and field service facilities which the company offers.

During previous C.P.A.M. meetings it had been made evident that more detailed technical information was required if the Chief Engineers of various airlines were to be able to appreciate whether it was technically possible to fit British replacement equipment. With this in mind, Smiths not only produced the comprehensive brochure referred to above, but also demonstrated to the members of the committee a mock-up of a typical Dakota instrument panel. This model was demonstrated particularly to Aer Lingus who, in company with all other operators of American aircraft, are now faced with difficulties in providing dollars for spare parts which, in any case, are not readily available.

At the moment Aer Lingus is in the throes of tackling the problem of replacement aircraft. It has been the company's expressed intention to "buy British," if at all possible, and it seems likely, therefore, that a decision will soon be taken on either the Viscount or the Ambassador.

The C.P.A.M. party displayed a deep interest in the exceptionally well-appointed terminal building at Collinstown and during the afternoon several delegates toured the Aer Lingus maintenance installation which is now in the process of reorganization.

One of the most encouraging features of the conference was the general atmosphere of amity and co-operation which pervaded the meeting. The motto, "United we stand; divided we fall," was readily apparent in both the business and the subsequent social sessions which the party attended.

Among those who took part were representatives of B.E.A., B.O.A.C., K.L.M., Swissair, D.D.L., A.B.A., D.N.L., Aer Lingus, Sabena and Air France.

FORECASTS from JOHANNESBURG

Mr. Whitney Straight Discloses B.O.A.C. Operational Intentions

WE have received a revealing report from a South African correspondent on the subject of Comets, Bristol 175s, Hermes IVs and their respective futures, as described and discussed in Johannesburg by Mr. Whitney Straight, B.O.A.C.'s deputy chairman, who is at present making a tour of the South African routes. Several statements confirm impressions expressed earlier in *Flight* regarding such matters as the improved performance of the Bristol 175 in its latest conception, and the method of operation of the Hermes IV or, more particularly, its Hercules power plants, on the South African services.

Mr. Whitney Straight, in an interview, said that five of the 14 Comets ordered by B.O.A.C. are to be fitted with Rolls-Royce Avon axial-flow turbojets. With them, he added, and without further development, the Comets would be able to fly the Atlantic and make a return journey within the day. Westbound, they would need one stop, probably at Gander. Eastbound, they might be able to fly New York-London non-stop when winds were favourable.

Mr. Straight said that all the surprises in Comet development had been on the right side. It was hoped to have them in service by the end of this year, but, with experience of other airliners in the past in mind, he hesitated to give a nearer date. The route on which they would be used had not yet been chosen.

He also described B.O.A.C.'s long-term plans—three different types of aircraft would be used. One would be the Comet, for long-range, high-speed, first-class services; the second would be the Bristol 175, for tourist-class travel at lower fares and without frills. The third type would be a freighter, so far unchosen.

Mr. Straight said that the Comet might achieve an entirely new standard of utilization. It was expected to get more than ten flying hours a day, or 3,650 a year, from each machine. At present B.O.A.C. and other airlines were getting about eight hours from Constellations and Stratocruisers on the Atlantic run.

He said that the Bristol 175 "is quite an aircraft." It has been extensively modified since the M.R.E. specification was announced. To-day it has a range of 5,500 miles, pressurization for 35,000ft, and, as announced, four Bristol Proteus turboprops instead of (for a start) Centaurus piston engines. Its first flight would be in about a year and it should enter service in 1953-4.

"The 175 is starting at the stage reached by the future gas turbine DC-6s and Constellations," said Mr. Straight, "but it has the advantage that it is designed from the outset for gas turbines." It would be the cheapest airliner in the world to operate, assuming average utilization of about 7½ hours a day. It could have between 46 and 92 seats and they would be movable. As a luxury aircraft with 46 seats it would have the most room and best comfort of any airliner flying.

Cruising speed of the 175 would be between 330 and 375 m.p.h. and it would be able to land at any good airport, especially as it was to have a bogie undercarriage like that of the Comet.

Mr. Whitney Straight mentioned that the B.O.A.C. Comet Development Unit had been charged with preparing all possible details for the new airliner before actually receiving one. One of the objects of his present tour of Africa was to inspect airfields and installations in readiness for Comet services in 1952.

"On the whole the airfields are good," he said. "One or two need improvements which are being undertaken. At Kano, for instance, a new runway is being built. I am most anxious to ensure that the Comet should not be held up because some place or other lacks the proper radio aids.

"One aspect we have to watch rather carefully is that, with a jet, 40 per cent of the operating cost is taken up by fuel. As the price varies from place to place we have to give serious consideration to routes on this score."

He confirmed that the Hermes was to have a vee-rod installation in its Hercules engines in place of the present arrangement. At the moment the engines were being operated on a "low boost, high revs" principle to avoid strain on the connecting rods. When the power units of the whole fleet had been vee-rod-modified the Hermes would be operated on the traditional "high-boost, low revs" pattern with reduction in vibration and improvement in altitude, reliability and speed. Instead of cruising at about 222 m.p.h. T.A.S. at 13,000ft, as at present, it would cruise at nearly 260 m.p.h. true at 20,000ft.

To this report may be added the information that the difficulties of financing the building of Jan Smuts field, to which reference was made in *Flight* of September 21st, 1950, have not been resolved. B.O.A.C. are naturally keenly interested in the larger airport with high-speed, long-hop Comet services in mind, but South African Airways have no worries on the score of load and runway length, because their new 749A Constellations can cope at Palmietfontein, whence all companies and all long-distance services at present operate.

CIERVA-SARO LINK

IT is announced that, with the agreement of the Ministry of Supply, arrangements have been completed between Saunders-Roe, Ltd., and the Cierva Autogiro Co., Ltd., for Saunders-Roe to take over development of current types of Cierva helicopters (Air Horse and Skeeter). A number of the Cierva design, engineering and flight team have been engaged by Saunders-Roe in connection with this work.

The Air Horse is, of course, the large experimental three-rotor helicopter which, developed by the Cierva Company, first flew in December, 1948. Two have been constructed; one was lost in an accident last year. The Skeeter is a light two-seater, suitable for private ownership or training. The Mk. I prototype first flew at Eastleigh in October, 1948.

The Cierva Company will continue on helicopter research, and for the time being communications may be addressed c/o Saunders-Roe, Ltd., Southampton Airport, Eastleigh, Southampton.

NEW R.Ae.S. SCHOLARSHIPS

THE council of the Royal Aeronautical Society draws attention to the conditions of two new scholarships which it is awarding. Details are as follows:—

The Royal Aeronautical Society Charter Scholarship.—A scholarship or scholarships up to the value of £300 a year, in the first instance to be awarded for a period of one year, although an extension for a second year will be looked upon favourably if it is clear that the student and the work will benefit.

The Geoffrey de Havilland Memorial Scholarship.—A scholarship or scholarships up to the value of approximately £120 a year for a period of one year or longer, as above.

Both these scholarships will be awarded annually, or at other times which may be decided, to assist students wishing to undertake advanced study in aeronautics. They will be awarded only to those who can satisfy the council that they have the necessary qualifications to benefit, and whose proposals for work or further studies are acceptable. Normally, the work should lead to some higher degree or post-graduate diploma, although this is not essential.

Students wishing to apply for the scholarships should write to the Secretary of the R.Ae.S. (4, Hamilton Place, London, W.1) before June 1st, stating the course they intend to follow, and giving full particulars of their age and the results of any examinations they have taken.

WELL-MERITED AWARDS

TWO veteran pilots and an outstandingly successful competitor in speed events have been honoured by the award of Royal Aero Club medals. Sir Geoffrey de Havilland, O.B.E., who holds Aviator's Certificate No. 53, receives the Silver Medal of the R.Ae.C. "for his achievement in piloting aircraft for over 40 years and still holding a current Pilot's Licence." Another Silver Medal is awarded to Maj. H. A. Petre, D.S.O., M.C. (Certificate No. 128) "in recognition of his achievement in flying aircraft, chiefly as a private pilot, since 1911, and in still flying aircraft and gliders."

Sir Geoffrey de Havilland, O.B.E.

Mr. F. Dunkerley.

The racing pilot is Mr. Fred Dunkerley, the well-known Gemini owner; he receives the Bronze Medal of the R.Ae.C. "in recognition of his outstanding performance in 1950," when he won the Kemsley and Siddeley Trophy Races, was third in the Goodyear Trophy Race, and fifth in the King's Cup.

The medals are due to be presented after the R.Ae.C. annual general meeting on March 28th.

CIVIL AVIATION NEWS

ANGLO-INDIAN AGREEMENT

AN agreement covering the operation of British and Indian air services was initialled at New Delhi on Thursday, January 25th, by representatives of both Governments. Negotiations had been proceeding in New Delhi between delegations from the two countries since January 11th.

The new agreement brings to an end the temporary arrangement by which airlines have operated during the past 18 months. It provides for a periodic review of the conditions under which services are run, in order to assure that the basic objective of equal opportunity for each operator is attained.

At present India is served by B.O.A.C., while flights to this country are carried out by Air India International.

I.A.L. EXPANSION

AMONG the world-wide activities of International Aeradio, Ltd., last year, the most important development was the formation of an associate company in the Caribbean. This was followed immediately by a large-scale expansion of I.A.L.'s interests in the Western hemisphere. The localities at which radio stations have been taken over now include the following: Palisadoes Airport, Jamaica; the radio beacon at South Caicos and facilities in Grand Cayman; Atkinson Field, British Guiana; Seawell Airport, Barbados; and a number of other points throughout Antigua, the Leeward Islands, Grenada and St. Lucia.

When the operational requirements for services to Dominica, St. Vincent and Montserrat have been determined, the company will also maintain stations at these points. Pan American and B.W.I.A. stations at Trinidad and Tobago were absorbed by I.A.L. in September and negotiations are now being conducted with the Trinidad Government to determine the pattern of future operations. A signals plan based on the recommendations of the I.C.A.O. Regional Conference in Havana has been drawn up and accepted by airlines operating throughout the Caribbean.

In the eastern hemisphere the company was recently called on to supply traffic-control advisors to the Italian Government, while telecommunications advisors have been appointed to the Hashemite Kingdom of Jordan and also to Somaliland.

Ground equipment is now being installed at 28 airfields in South Africa while at Bahrein the company has entered a new field of activity in taking over the responsibility for airport fire services. In Rangoon, work is going ahead on designing a new air-traffic control centre which, when completed, is expected to make the airport one of the finest in the East.

HARD-WORKED CONSTELLATIONS

A RECENT analysis of the flying times of B.O.A.C.'s Constellation fleet during the past four years reveals that a daily utilization of as much as 6 hr 3 min per aircraft has been achieved. This figure is based on all flying-time recorded by the fleet since July, 1946; it includes scheduled operations, training, and positioning and test flights, in addition to the time lost when aircraft have been out of service for overhaul, maintenance and repair.

Despite the fact that the Constellation 049s were grounded from July 12th to August 18th, 1946, for electrical modifications, a daily utilization of eight hours per aircraft was reached within 13 months of the initial services. Peak efficiency was reached during the months of April to September, 1948, when the Corporation was operating a total of nine transatlantic return services a week, together with a daily service between New York and Bermuda. Average utilization was then 8 hr 25 min.

Following the fall in frequency which was caused by the transfer of B.O.A.C.'s Constellation base from Dorval to Filton in 1948, utilization gradually increased throughout 1949 until the type was progressively replaced by Stratocruisers on the North Atlantic services last year. In December, 1950, the "Connies" were still averaging 5 hr 11 min flying per day.

THE MILL HILL ACCIDENT

THE public enquiry into the accident to B.E.A.'s Dakota G-AGIW, which crashed on October 17th near Mill Hill, North London, resulting in the deaths of 27 people, opened in London on January 15th. The president of the court was Mr. J. Roland Adams, K.C., who was assisted by G/C. J. A. Hawkings, of R.A.F. Transport Command, and by Capt. C. B. Houlder, a B.O.A.C. senior captain.

The accident occurred in conditions of low cloud and 2,000yd visibility. Evidence obtained from the sole survivor, the steward, indicated that the aircraft was being flown by the first officer with the captain occupying the right-hand seat. After leaving Northolt the aircraft apparently suffered a failure of the starboard engine and the captain requested G.C.A. assistance for an immediate landing. The aircraft was handed over to the radar controller, who identified it as being four miles from the airfield on a bearing of 075 deg. The captain was last heard to acknowledge a course of 060 deg, after which the blip faded from the radar screen.

Ground witnesses gave evidence of seeing the aircraft, apparently in difficulties, attempting to climb sharply to avoid a steeple—presumed that of Harrow Church. Examination of the wreckage showed that the Dakota was flying due east when it hit a group of beech trees on Highwood Hill, shed its port wing and dived vertically into a road; it then bounced 40ft, turned over and burst into flames.

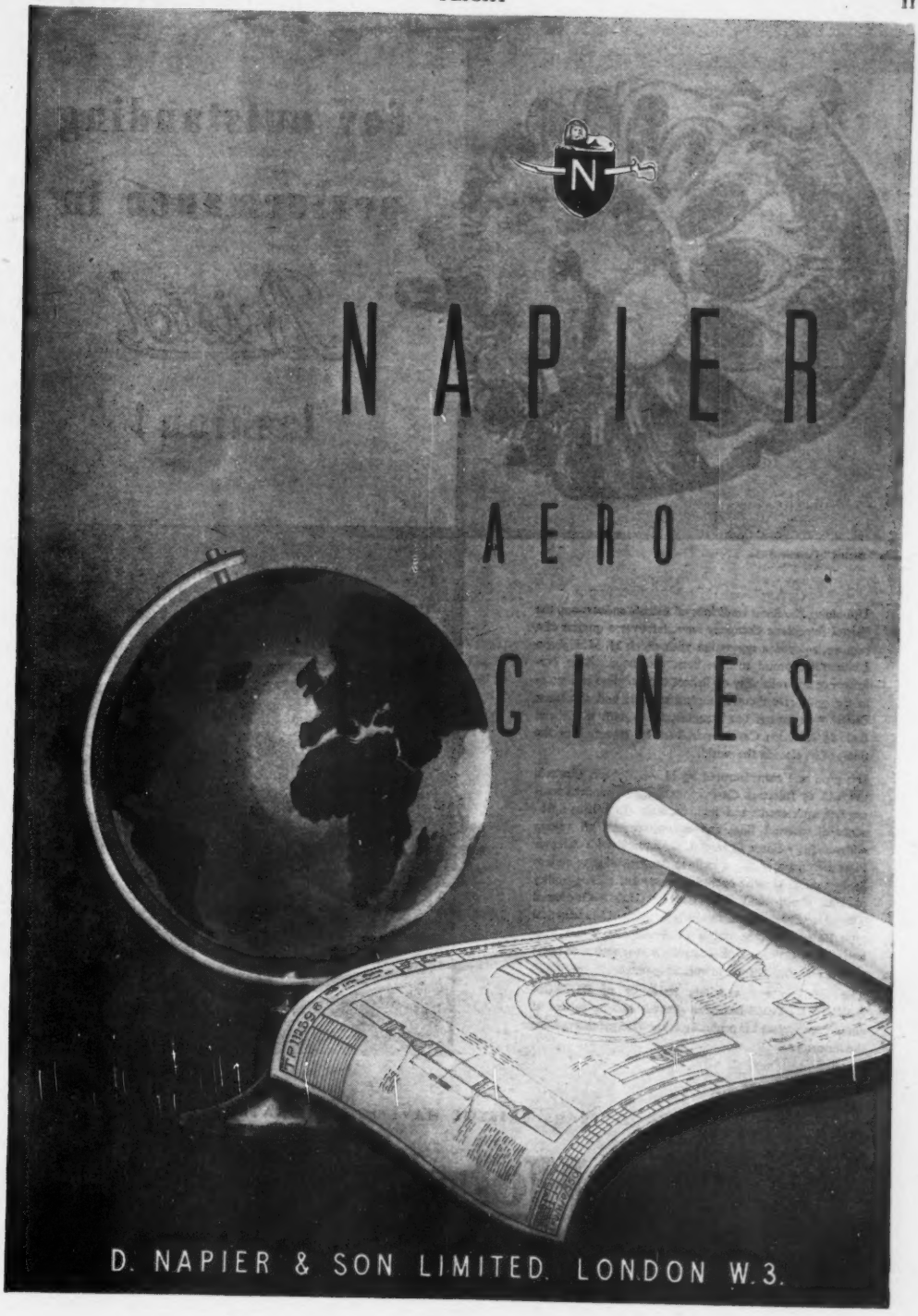
Although the undercarriage was locked down at the time of impact it was found impossible to ascertain whether this position had been preselected. All witnesses agreed that the starboard engine was inoperative, and the greater number of witnesses agreed that the undercarriage was down when the aircraft was last seen in flight.

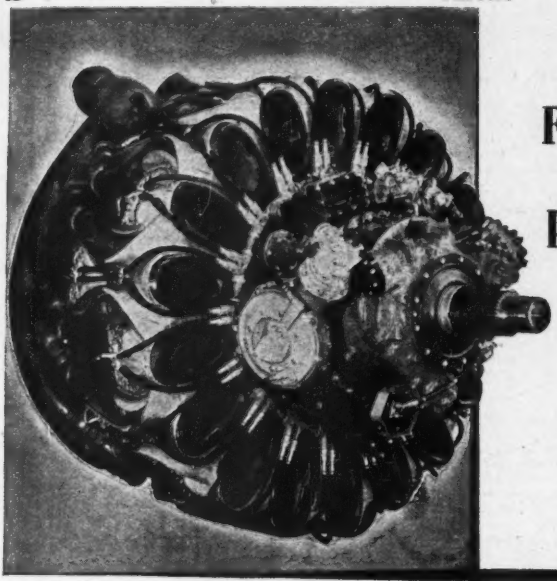
The enquiry has now been postponed until February 5th, because of the indisposition of the president of the court. A full report of the proceedings will appear after the court has resumed and information is complete.

BOLDON AIRPORT PROJECT

DURING a recent visit to airports in the north of England, the Minister of Civil Aviation, Lord Pakenham, discussed with the North-east Joint Airport Committee the question of airfield facilities in the area. On his tour Lord Pakenham visted the airfield site at Boldon, near Durham, where he expressed his personal conviction that it was the best location for an airport

EIRE BOUND: About to board B.E.A's first Pionair at Northolt, before its first commercial flight last Wednesday, are the members of the Committee for the Purchase of Aviation Materials who met in Dublin to discuss current re-equipment and spares problems affecting European airlines. As reported on page 122 the Pionair was demonstrated to Aer Lingus officials on the day after its arrival in Dublin. Members of the party were favourably impressed by its improved standard of comfort.


N
NAPIER
AERO
CINES
D. NAPIER & SON LIMITED. LONDON W.3.



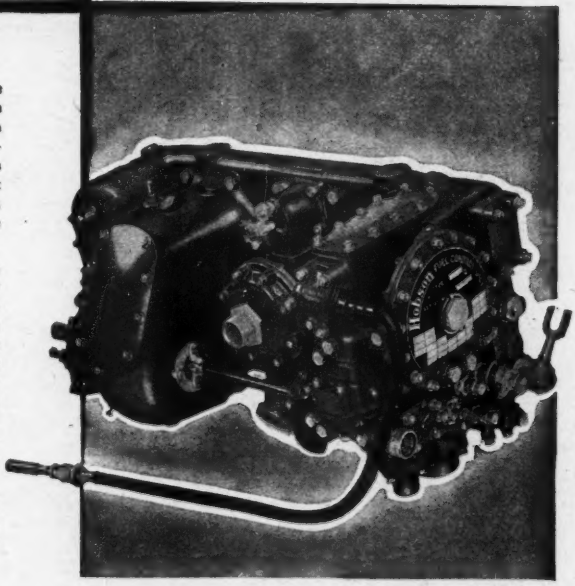
The "Bristol" Centaurus 661

For outstanding performance in Bristol fashion!

Upholding the finest traditions of British endeavours, the Bristol Aeroplane Company have, for over a quarter of a century, enjoyed a reputation with which H. M. Hobson Limited are proud to have been associated. The performance and reliability of Bristol aero-engines to-day, as in the past, rate them as second to none and the latest Bristol "Centaurus 661" engine, fitted with a Hobson B.C. 15 Injection Carburetter, may be regarded as the finest of its class in the world.

Designed and manufactured by H. M. Hobson Limited, the B.C. 15 Injection Carburetter fulfils all modern aero-engine requirements and includes such features as • Absence of external lines and accessibility of all tuning adjustments • Boost Control Unit integral with Adaptor Plate and incorporating a built-in Servo Motor to relieve load on pilot's throttle operating lever • Interchangeability of Fuel Pump and Fuel Control Unit • Oil-heated Throttles • Provision for the incorporation of a mechanical type Boost Override and a Methanol and Water System • Fuel Control Unit completely responsive to boost pressure throughout whole operating range.

The precision and unfailing reliability of HOBSON CARBURETTERS has been proved in every sphere of aircraft activity and is generally acknowledged throughout the industry.



Hobson B.C.15 Injection Carburetter

FOR 25 YEARS BRISTOL HAVE INCORPORATED

Hobson

EQUIPMENT

H. M. HOBSON LIMITED, FORDHOUSES, WOLVERHAMPTON. *Licensees in U.S.A. and Canada: Simmonds Aerocessories Inc.*

CIVIL AVIATION NEWS . . .

to serve this region. He subsequently stated, however, that there was no immediate possibility of financing the project.

It had previously been announced that the construction of Boldon airport would have meant the "sterilization" of large areas of coal and that, as it was an uneconomic proposition, the plan would have to be dropped. The M.C.A. has now been told, however, that if the scheme is put into effect it will still be possible to work the coal under the site.

B.E.A. VIKINGS GROUNDED

AS a precautionary measure, B.E.A. have temporarily withdrawn from service 19 of their 41 Vikings used on Continental routes, following the discovery of a slight crack in the hub of one airscrew. The crack is said not to be a basic constructional defect, but the result of more rapid wear and tear than had previously been envisaged.

The decision to ground these aircraft with effect from last Saturday was taken after consultation with the A.R.B. Passengers booked on the Madrid service were transferred to B.O.A.C. flights, while Brussels passengers were carried by Sabena. The Corporation is also operating some Dakotas—normally used on internal routes—to augment the remaining Vikings on Continental services. On the 19 suspect machines airscrews or parts of their mechanism are being replaced.

Although it was thought that some re-arrangement of schedules would be necessary during the early part of this week, the Corporation hopes to return to normal working by this week-end.

The grounding of these Vikings should not be taken as a reflection on the aircraft itself, which to date has enjoyed a reliability record second to none. Drastic though this action may at first appear, it is convincing proof of the stringent safety measures which British airlines are prepared to take.

HIGH TEA

PERHAPS nowhere in the world is such skill and discrimination devoted to the British art of tea-making as in B.O.A.C.'s airliners. Because the preparation of tea in elevated circumstances demands an unusual technique, the Corporation's stewards and stewardesses are given special tuition to enable them to produce the perfect cup under difficult conditions.

The boiling point of water (212 deg F at sea-level) drops one degree for every 550ft of altitude, so that at 8,000ft, the pressurized cabin height at which the aircraft normally fly, the boiling point will have fallen by about 14 deg. F.

With this in mind B.O.A.C. have blended a special tea which infuses at the lower boiling point, yet gives the expected fragrance and taste. All equipment is pre-heated and an extra spoonful of tea added in a quart pot for every 5,000ft of cabin altitude. Extra tea is also added when a water source is known to contain a higher percentage of lime.

B.E.A. IN 1950

IN the current issue of the *B.E.A. Magazine*, the corporation's chief executive, Mr. Peter Masefield, gives some statistical evidence of the excellent progress which was achieved in traffic results during the past 12 months. Compared with the previous year, 30 per cent more passengers and mail were carried, 70 per cent more freight lifted; hours flown rose by 33 per cent, and revenue by 34 per cent, while productivity per employee also increased by 30 per cent.

Although traffic during November was poor, for the first eight months of the financial year (April 1st to November 31st inclusive) the Corporation realized a profit of £4,742, as compared with a loss of £403,978 for the corresponding period of the year before. Up to the end of October the profit had risen to £254,484, a figure which, unfortunately, was almost entirely offset by the November deficit.

Although during the past two months the general shortage of money, the international situation and bad weather have adversely affected operating results, the Corporation hopes that, with the help of the tourist trade to the Festival of Britain this year, an overall traffic increase of yet another 25 per cent will be achieved by the end of 1951.

Referring to the rising cost of operation, Mr. Masefield points out that the corporation's budget for the next financial year—beginning April 1st—shows that the increase in the cost of essential commodities will be substantial, a fact which will inevitably slow down B.E.A.'s progress towards achieving a profitable state and will also retard the hoped-for fare reductions.

Comparative results for the past two years are given below.

	1949	1950
Distance flown (miles)	15,185,062	20,409,115
Revenue passengers carried	709,203	912,615
Load ton-miles	23,699,249	30,570,544
Capacity ton-miles	38,546,183	52,323,098
Revenue passenger-miles	201,209,498	259,046,195
Mail carried (tons)	3,893	5,097
Freight (tons)	5,408	9,281
Passenger flights completed	69,156	86,262

OPERATION "JASSID"

TWO Hiller 360 helicopters were recently delivered to the home base of Pest Control, Ltd., at Bourne, Cambridge, after having completed an extensive spraying operation over 17,500 acres of cotton fields. The machines were first assembled and flight-tested at Khartoum and were then flown to the Gezira cotton-fields, where over 200 hours were completed in three weeks. Often, over 100 take-offs and landings were made by a single aircraft in a day; average utilization was five to six hours daily, although a maximum of eight hours was reached.

As in previous years, migratory birds proved to be a source of danger, especially when found in large flocks. On two occasions avoiding action was ineffective and large birds struck the rotor blades—fortunately causing little damage.

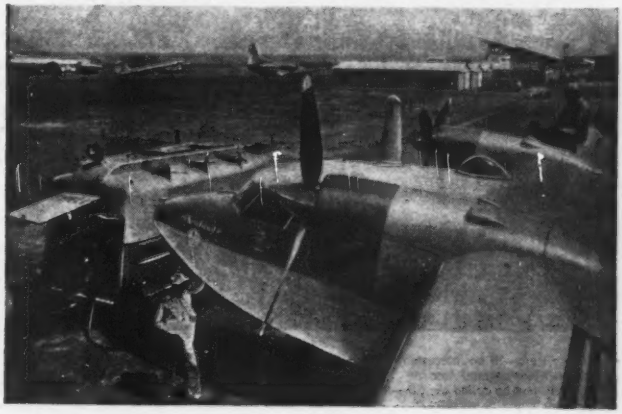
On completing the spraying programme laid down for protecing the cotton crop against jassids, the Hillers were partly dismantled and crated for air freight to the United Kingdom. They are now being reassembled at Cambridge and will be used to augment the existing Pest Control helicopter fleet.

AUSTRALIAN CROSS-WIND LANDINGS

FOR some time the Australian Department of Civil Aviation has been carrying out extensive trials with cross-wind landing gear, and the recent Operation "Haylift," which involved the transport of fodder to marooned cattle and sheep in flooded areas of New South Wales, often entailed landings in which this type of undercarriage was put to a particularly severe test.

Several of the aircraft thus equipped are reported to have landed successfully in right-angle cross-winds of up to 50 m.p.h. Normally, the undercarriages are not used in cross-wind components of more than 20 to 30 m.p.h., so it is apparent that the gear is capable of withstanding considerably greater stresses than those for which it is intended.

In Australia, where there are a large number of small but nevertheless important airfields in outlying country districts, it seems likely that widespread use will be made of the Goodyear undercarriage which costs only £1,800 (approximately) as compared with the £75,000 needed to construct each paved runway of a bi-directional lay-out.



AMPHIBIOUS AMBASSADOR: Now taking part in an extensive demonstration tour of the Caribbean and South and North America is one of Short's versatile Sealand amphibians, here seen at Maiquetia airport, Caracas, Venezuela. The insignia on its nose denotes its additional duty as "herald" for this year's Festival of Britain celebrations. Refuelling of the aircraft throughout its journeys in the western hemisphere is being undertaken by the Shell Aviation Service.

CIVIL AVIATION NEWS . . .

BREVITIES

UNDER an agreement with the Maltese Government and B.O.A.C., B.E.A. now operate a weekly service between Malta and Cairo on behalf of Malta Airways and Air Malta, Ltd. The route also serves Tripoli and Benghazi.

* * *

A C.A.B. examiner is reported to have approved a B.O.A.C. request for permission to make an intermediate stop at Boston on the London-New York service. Full approval by the C.A.B. is now being awaited.

* * *

Last year United Air Lines carried more than 2,500,000 passengers and flew an estimated 1,520,000,000 revenue passenger-miles—increases of 14 and 13½ per cent respectively over the figures for the previous year. Freight also rose by 20 per cent and air express by 38 per cent.

* * *

The interiors of Lockheed's new Super Constellations will incorporate many of the ideas of Mr. Henry Dreyfuss, the industrial designer whose ideas have been incorporated in many American railway coaches, ships' staterooms and hotel furnishings. Mr. Dreyfuss is said to be particularly interested in the application of "club car" or lounge interior layouts to transport aircraft.

* * *

According to A.N.A.'s managing director, Mr. Ivan Holyman, the company will in future make increasing use of British aircraft. Particular interest is being shown in the Viscount, Comet, Ambassador and the Hermes V. Meanwhile A.N.A. also hope to augment their present fleet with two or three more Skymasters, although difficulties are being experienced in procuring these machines.

* * *

Bahamas Airways, Ltd., a subsidiary of B.O.A.C., have taken delivery of two converted DC-3s from the Smith Aircraft Corporation of Florida. Seating capacity has been increased to 32 and a buffet added. Other refinements include interior redecorating and built-in passenger steps. Permission is being sought for C.A.A. approval of a 26,200 lb all-up weight.

* * *

International transactions made through the I.A.T.A. Clearing House in London during November indicate that the volume of world airline traffic continued at a high level even during the winter months. Clearances totalled $12,000,318, which was almost the same as the October total. The turnover of transactions between I.A.T.A. members during the months from January to November inclusive were $132,628,000. The offsetting of credit and debit accounts by Clearing House members during November eliminated the need for cash payment on 86.8 per cent of all transactions.

* * *

Remembering the transport difficulties which they experienced during World War II, many U.S. businessmen are now said to be showing interest in the twin-engined executive type of aircraft. In the present international situation the demand for such machines is growing rapidly, and at least one British type—the D.H. Dove—is already helping to meet it.

* * *

Under new security regulations all American private aircraft flying through special "defence zones" must file flight-plans with the relevant traffic-control centres. Violation of the rule is punishable by a year's imprisonment, a $10,000 fine and the possible cancellation of pilots' licences.

* * *

The M.C.A. has granted permission for Scottish Aviation, Ltd., to run charter services, beginning this month, which will link Prestwick with seven English cities. The agreement stipulates daily feeder services from the Scottish airport to Brough, Exeter, Birmingham, Blackpool, Liverpool, Leeds and Newcastle. From June the company will also run thrice-daily flights between Prestwick and Ronaldsway, Isle of Man.

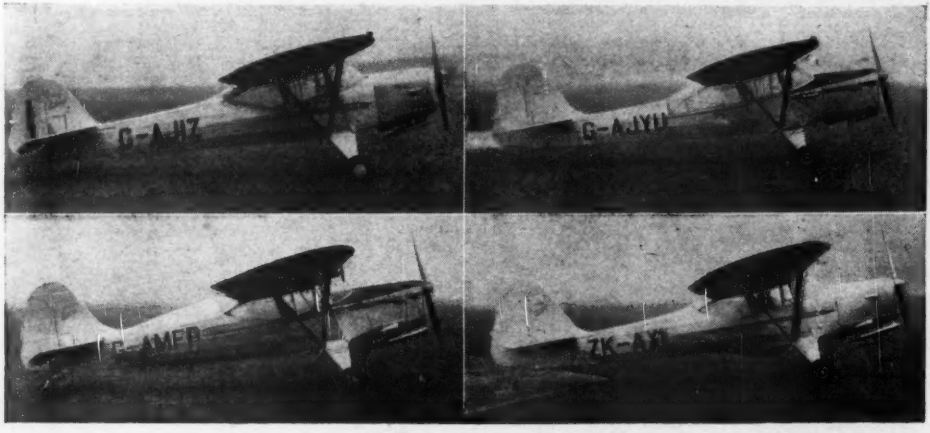
* * *

Field Aircraft Services, Africa, Ltd., have acquired the assets of Rhodesian Aircraft Maintenance and Services, Ltd. A new company is now being formed which will not actually operate aircraft but will concentrate on supply, maintenance and repair work, acting as agents for their parent company in this country, Field Aircraft Services, Ltd. The latter firm, incidentally, are now engaged in delivering ten Dakotas which have been sold to The Union of Burma Airways. Field's recently supplied three Dakotas to B.E.A. and another to Cyprus Airways.

* * *

Following the arrival of an S.O.30 Bretagne at Teheran for delivery to Iranian Airways, His Majesty the Shah of Iran expressed a wish to fly the machine personally. He subsequently piloted the Bretagne for an hour at 17,000ft over Mount Jeinavend, the highest peak of the Elbruz mountains. On landing he expressed his satisfaction with the machine's handling qualities and was quoted as being impressed by its low-speed manœuvrability. Iranian Airways have now put the aircraft into service on the route between Paris, Teheran and Bombay.

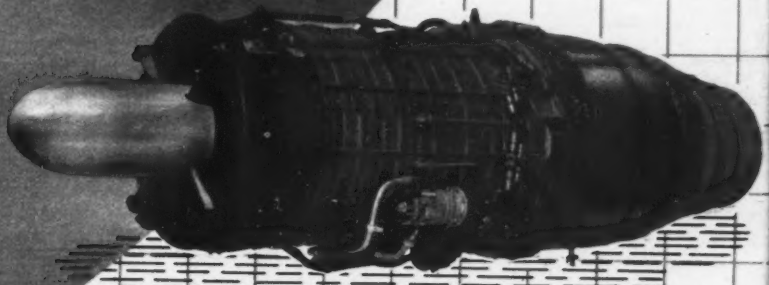
FOUR OF A KIND : RECENT AUSTER TYPES



Not only spotters will be interested in these four comparative side views of closely related Auster products. At top left is the well-known three-seat Cirrus-Minor-engined Autocrat ; below it the four-seat Autocar with Gipsy Major I ; at top right is an interesting hybrid (converted to special order) which may be called the 5D—it is basically a Mk 5 with Autocar tail and Gipsy Major engine. Below it is the new three/four seat Aiglet with large tail and Gipsy Major engine ; this version is similar to the 5D in many respects and is the subject of a description on pages 118-119.

ARMSTRONG SIDDELEY GAS TURBINE DEVELOPMENT

already 7,200 lb. thrust



Armstrong Siddeley

Sapphire

POWER / ERFORMANCE

ARMSTRONG SIDDELEY MOTORS LIMITED, COVENTRY Members of the Hawker Siddeley Group

Unequalled experience in
the light transport field

DE HAVILLAND

DH AIRCRAFT DH ENGINES DH

End of an era: the present world's speed record is possibly the last to have been observed from ground-level. The record-holding F-86 Sabre is pictured during one of its 670-m.p.h. runs over the 3-km course at Muroc in September, 1948. Maj. R. L. Johnson was the pilot.

RECORD REVIEW

Current Air Records : International Competition Decreases : Britain's Place in the F.A.I. Lists

IF any new flying achievement is to be claimed as a record, in either "world" or "national" classification, it must be observed by representatives of national clubs affiliated to the Fédération Aéronautique Internationale. The F.A.I., which was founded in Paris in 1905, is the body authorized, by international agreement, to homologate (i.e., to approve) a record. Its supervision over aerial competition dates from November, 1906, when Santos Dumont was officially timed at 25 m.p.h. over a 721-ft course.

Every three months the F.A.I. issues a list of current holders of over 200 records for various classes of aircraft, including models. A study of the latest list (the more important sections of which are reproduced in the following pages) discovers that its pages do not always reflect modern technical achievement. Many records have stood for over ten years: international rivalry has not been particularly intense since the war, and within the past year or two, especially, few major records have been established. Numerous reasons underly this apparent apathy towards record-breaking.

An explanatory case is that of the world's absolute speed record, which America has held unchallenged since September 15th, 1948. The record-breaker was Major Richard Johnson, U.S.A.F. test-pilot, who flew a standard F-86A Sabre fighter at nearly 671 m.p.h. low above the measured 3 km course at Muroc Dry Lake. Several aircraft have since exceeded this performance, notably the Bell X-1 and Douglas Skyrocket, both of which have made several supersonic flights at true air-speeds above 700 m.p.h. The X-1 is, in fact, rumoured to have attained Mach 1.4, which represents almost 1,000 m.p.h. at high altitude.

To enable such aircraft to be used in speed-record attempts, the F.A.I. decided—at its annual conference in Stockholm last July—to permit any method of take-off (the Bell X-1 is normally air-launched), a longer course (12-25 km instead of 3 km) and—most significant—complete freedom in the choice of height for the attempt. A maximum altitude of 400 m was formerly stipulated.

No attempts have yet been made under the new conditions, but the way is now clear for America's research aircraft to establish records which would be very difficult to beat. The only real difficulties are the short endurance of present rocket motors (two runs, in opposite directions, must be made over the course) and the difficulty of measuring speed to the required accuracy of 0.5 per cent. One other objection arises, on the score of security; the prestige-value of a new record might be considered less important than the disadvantage of revealing so openly the performance of secret aircraft.

The same objection might possibly have overruled the attractions of establishing five new records instituted by the F.A.I. last July and so far ignored—for rates of climb to heights of 3,000, 6,000, 9,000, 12,000 and 15,000 metres. Obvious contenders for these honours would be Britain's Avon- or Sapphire-powered Meteors, either of which could set up hard-to-beat records in all five categories on a single test-flight, if suitably observed by recording instruments.

Returning to the speed record, one sees little prospect of Britain's regaining, in the near future at least, her eminence of Schneider-Trophy days or the immediate post-war period. Although the Hawker P.1081 and Supermarine 535 are probably capable of speeds in excess of the present record-figure, sheer speed is expressed to-day, first and foremost, by those aircraft built purely for research. And, where high-speed research aircraft are concerned, America is well ahead of any other nation.

On the other hand, Britain does hold three important jet-

Record in the making: inside the cabin of the Comet on its 447-m.p.h. flight from London to Rome last March. Crew-members shown are (left to right) John Cunningham, Peter Bugge and Brockstone Brown (flight engineer). The return flight was made at 453 m.p.h.

"Flight" photograph.

RECORD REVIEW . . .

aircraft records, all of which demonstrate practical qualities found in British fighters. No attempt has been made to better John Cunningham's altitude record of 59,445ft, set up in a Ghost-powered Vampire nearly three years ago. The qualities of that particular aircraft were later, as we know, to be embodied in the Venom intercepter. The 100 km closed-circuit record, calling for combined speed and manœuvrability, still stands to the credit of John Derry (D.H.108) at 605 m.p.h., and last May Jim Cooksey established a new 1,000 km record in a Meteor 8 at 511 m.p.h.

For piston-engined aircraft, two of the major performance records—speed and altitude—are still held by pre-war machines specially prepared for record purposes. The distance-in-a-straight-line record of 11,228.915 miles, established by a Lockheed Neptune (Cdr. Davies and crew) in 1946, was exceeded by a flight-refuelled B-50 last year but still stands as an absolute and class record. There seems to be no immediate prospect of any new long-range attempt. The third absolute record—altitude—was captured 15 years ago in a specially designed balloon by two American Army officers who ascended to 72,376ft—a formidable target for any present type of heavier-than-air machine. The next absolute altitude record may well be set up by a rocket-powered research machine.

An interesting example of systematic record-breaking was given by America early in 1946, when several crews used one aircraft-type—the B-29—to "clean up" 17 out of the 18 F.A.I.-approved records for load-carrying machines. Given the opportunity, R.A.F. aircrews could have broken some of the records-with-load—using, for example, the Mosquito (as suggested by *Flight* nearly three years ago). Record-breaking could be undertaken by squadrons as part of normal training without incurring undue expense. Imminent re-equipment of some Bomber Command squadrons with Canberras offers a new chance of raising prestige and morale in this way—all, perhaps, in the course of squadron training.

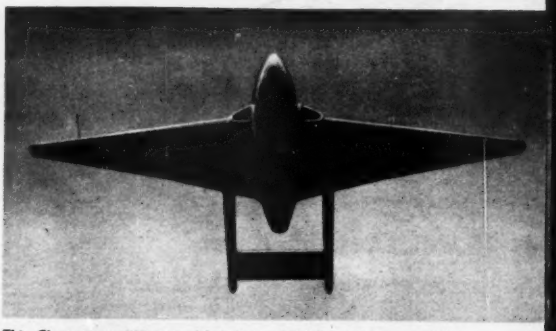
The actual cost of record-breaking, incidentally, need not always be heavy. Fees for official observation and formal homologation can be as little as £25. Prototypes can seldom be spared from development-flying for lengthy record-preparation, so official observation of performance can be (and often is) made during normal flight-testing. The remarkable series of point-to-point records established by the Comet during 1950, for example, did not hinder the prototype's progress: fuel-consumption tests, demonstration work and tropical trials were the main reasons behind the Comet's high-speed journeys abroad.

The expense of record-breaking can be reduced in other ways—as shown by the Royal Aero Club at Wolverhampton last July. New 100 km speed records for aircraft classified according to all-up weight had been instituted by the F.A.I., and the R.Ae.C. enabled British pilots to compete without undue effort by arranging the King's Cup Race course round a 100 km circuit. The result was that five new records were set up in one day by five British civilian pilots.

Many point-to-point records metaphorically cry out to be broken, having stood for over ten years to the credit of obsolete aircraft. Few manufacturers or private individuals can to-day afford the effort required to erase these anomalies; but some of the records are—unofficially—broken almost daily by modern airliners on scheduled services. The fees for official observation would represent a drop in the financial ocean of an airline's budget.

For helicopters, there are eight records—all of which are held by American Sikorsky machines. British helicopter development is outscaled by the American industry, but in at least one class—speed—this country may regain the honour formerly held by the Fairey Gyrodyne; a promising possible contender is the Bristol 171. It was once expected that the unique Saunders Roe S.R./A.1 might capture the speed—and, possibly, altitude—title for *hydravions*, but misfortune befell two of the three prototypes. However, hope still exists in the form of the remaining example, which is flying again after modifications.

All the speed records *feminins* are held by the intrepid Miss Cochran, Mustang-pilot. More than one suggestion has been made during the past few years that an ex-A.T.A. woman pilot, given a Vampire conversion-course, could adequately tackle these records. Such suggestions have not been taken up but, technically, the proposition is quite sound and could be brought fully up-to-date by substituting Venom for Vampire.



This Ghost-powered Vampire I, which has held the altitude record for aeroplanes (59,445 ft) for nearly three years, was an experimental forerunner of the Venom. The prestige gained by its performance was, therefore, incidental to a practical job of work.

In the amphibian class, 12 records exist. Russia holds six, America four, Italy one and—with effect from last July—Britain one. This good example was given by Leslie Colquhoun of Vickers-Supermarine, flying the Griffon-powered Seagull, which averaged 242 m.p.h. over the 100-km course of the Air League Cup Race at Sherburn-in-Elmet last July.

The patriotic Briton, scanning the list of performances by gliders, will be disappointed to find that his country is not once represented among 13 record-holders—French, Russian, German, Swedish, American and Swiss. Turning to the section devoted to model aircraft, he notes that Russia and France hold the four absolute records. He will feel grateful towards Messrs. Raymond Musgrove and Michael King, for their helicopter and flying wing, respectively, are the only two British models mentioned in a list of 43 records open to world competition.

As international rivalry for record-honours abates, the records themselves lose prestige-value and are eventually forgotten: so much is obvious from the briefest survey of the F.A.I. lists. It would be unfortunate if the "priorities" of to-day caused every type of formal competition to lapse, giving way entirely to more practical but less colourful commercial success or military advantage. It is to be hoped that British aviation will, in the near future, help to find a compromise.

R. B.

In the following pages are extracts, showing the principal records, from the official F.A.I. lists as amended to date by the Royal Aero Club.

INTERNATIONAL CLASS RECORDS

"ABSOLUTE" RECORDS

Straight-line distance (United States).—Cdrs. Davies, Rankin, Reid and Tabeling, U.S.N. (Lockheed P2V-1). Perth, Australia, to Columbus, Ohio, Sept. 29th-Oct. 1st, 1946. 18,081.990 km (11,237 miles).

Altitude (United States).— Capt. O. A. Anderson and Capt. Albert W. Stevens (4,000 cu m balloon), Nov. 11th, 1935. 22,066 m (72,395ft).

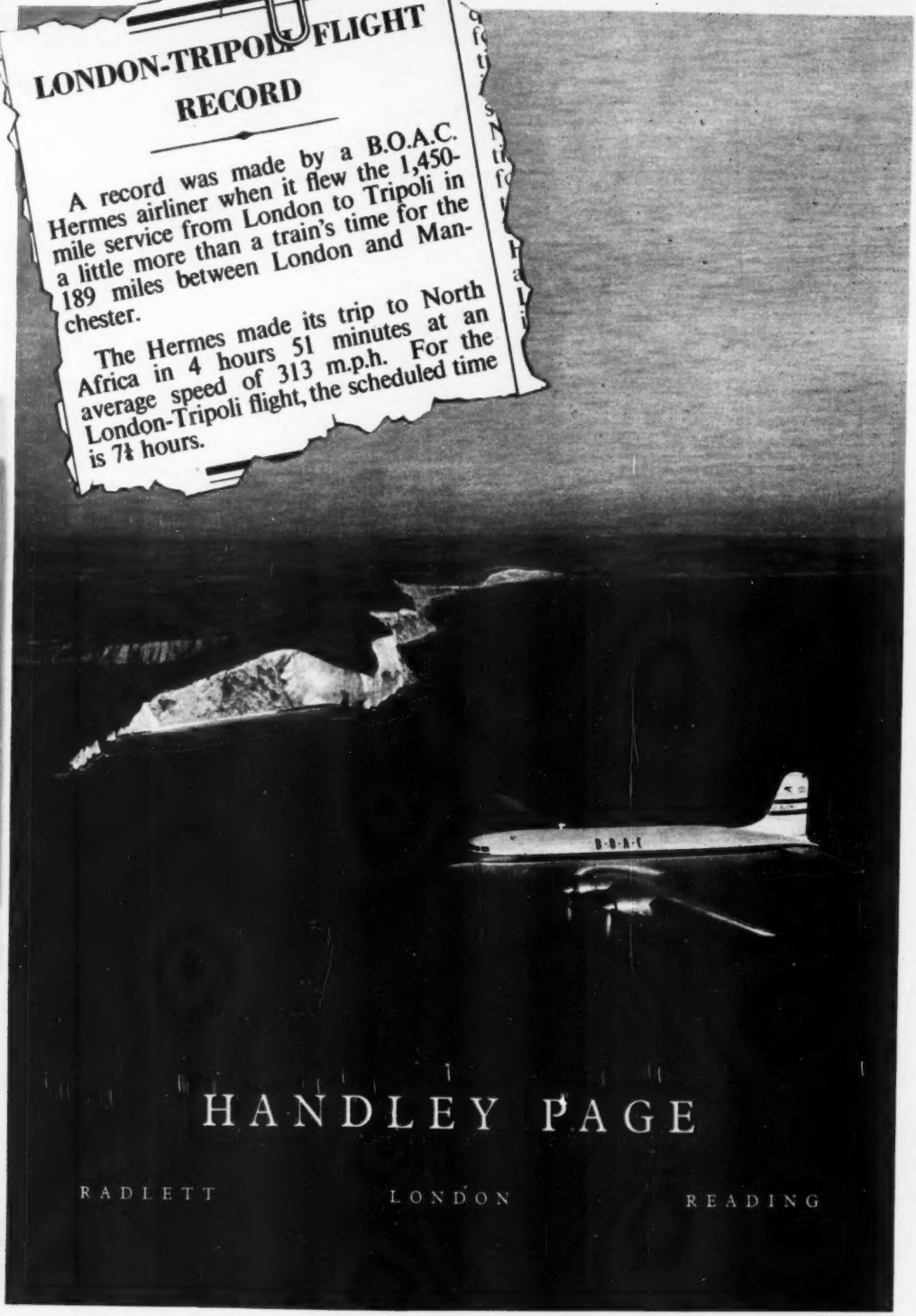
Speed at Low Level (United States).—Maj. R. L. Johnson, U.S.A.F. (North American F-86), Sept. 15th, 1948. 1,079.841 km/hr (670.981 m.p.h.).

Coming into service with
the Royal Navy
THE SEA HAWK
HAWKER AIRCRAFT LIMITED
Member of the Hawker Siddeley Group

LONDON-TRIPOLI FLIGHT RECORD

A record was made by a B.O.A.C. Hermes airliner when it flew the 1,450-mile service from London to Tripoli in a little more than a train's time for the 189 miles between London and Manchester.

The Hermes made its trip to North Africa in 4 hours 51 minutes at an average speed of 313 m.p.h. For the London-Tripoli flight, the scheduled time is 7¼ hours.



HANDLEY PAGE

RADLETT LONDON READING

RECORD REVIEW . . .

CLASS A (Balloons)

(8th Category, over 4,001 cu metres)

Altitude (U.S.A.)
Capts. O. A. Anderson and A. W. Stevens. Nov. 11th, 1935. 22,066 m

CLASS B (Airships)

Distance in a straight line (Germany)
Dr. Eckener.
LZ-127 (*Graf Zeppelin*) from Lakehurst, U.S.A., to Friedrichshafen.
Nov. 1st, 1928. 6,384.5 km.

CLASS C (Powered Aircraft)

Group 1: Piston-engined Aircraft

LANDPLANES

Closed circuit distance (U.S.A.)
Lt. Col. Lassiter and Capt. Valentine.
Boeing B-29. Aug. 3rd-5th, 1947. 14,249.656 km (8,854.5 miles).

Distance in a straight line (U.S.A.)
Cdrs. Davies, Rankin, Reid and Lt. Cdr. Tabeling (U.S.N.).
Lockheed P2V-1. Oct. 1st, 1946. 18,081.990 km (11,237 miles).

Altitude (Italy)
Mario Pezzi.
Caproni 161. Oct. 22nd, 1938. 17,083 m.

Maximum speed at low level (Germany)
Flugkapitan Fritz Wendel.
Messerschmitt Bf 109R. April 26th, 1939. 755.138 km/hr.

Speed over 100 km (U.S.A.)
Miss Jacqueline Cochran. Dec. 10th, 1947. North American P-51. 755.668 km/hr

Speed over 500 km (U.S.A.)
Miss Jacqueline Cochran. Dec. 29th, 1949. North American P-51. 703.376 km/hr

Speed over 1,000 km (U.S.A.)
Miss Jacqueline Cochran. May 24th, 1946. North American P-51. 693.780 km/hr

Speed over 2,000 km (U.S.A.)
Miss Jacqueline Cochran. May 22nd, 1948. North American P-51. 720.134 km/hr

Speed over 5,000 km (U.S.A.)
Capt. J. Bauer and crew. June 28th, 1946.
Boeing B-29. 544.590 km/hr

Speed over 10,000 km (U.S.A.)
Lt. Col. O. F. Lassiter and crew. July 29th-30th, 1947.
Boeing B-29. 439.665 km/hr

Records with Loads

Carrying 1,000 kg

Altitude (U.S.A.)
Major F. F. Ross and crew. May 16th, 1946.
Boeing B-29. 14,603 m

Speed over 1,000 km (Italy)
Ing. F. Niclot. Dec. 9th, 1937.
Breda 88. 524.185 km/hr

Speed over 2,000 km (U.S.A.)
Lt. E. M. Grabowski. May 17th, 1946.
Boeing B-29. 588.456 km/hr

Speed over 5,000 km (U.S.A.)
Capt. J. Bauer and crew. June 28th, 1946.
Boeing B-29. 544.590 km/hr

Carrying 2,000 kg

Altitude (U.S.A.)
Col. E. D. Reynolds and crew. May 13th, 1946.
Boeing B-29. 14,180 m

Speed over 1,000 km (U.S.A.)
Lt. E. M. Grabowski and crew. May 17th, 1946.
Boeing B-29. 594.963 km/hr

Speed over 2,000 km (U.S.A.)
Lt. E. M. Grabowski and crew. May 17th, 1946.
Boeing B-29. 588.456 km/hr

Speed over 5,000 km (U.S.A.)
Capt. J. Bauer and crew. June 28th, 1946.
Boeing B-29. 544.590 km/hr

Carrying 5,000 kg

Altitude (U.S.A.)
Lt. J. P. Tobison and crew. May 14th, 1946.
Boeing B-29. 13.793 m

Speed over 1,000 km (U.S.A.)
Lt. E. M. Grabowski and crew. May 17th, 1946.
Boeing B-29. 594.963 km/hr

Speed over 2,000 km (U.S.A.)
Lt. E. M. Grabowski and crew. May 17th, 1946.
Boeing B-29. 588.456 km/hr

Speed over 5,000 km (U.S.A.)
Lt. Col. R. G. Ruegg and crew. June 21st, 1946.
Boeing B-29. 428.123 km/hr

Carrying 10,000 kg

Altitude (U.S.A.)
Capt. A. A. Pearson and crew. May 8th, 1946.
Boeing B-29. 12,668 m

Speed over 1,000 km (U.S.A.)
Capt. J. D. Barlett and crew. May 19th, 1946.
Boeing B-29. 575.714 km/hr

Speed over 2,000 km (U.S.A.)
Capt. J. D. Barlett and crew. May 19th, 1946.
Boeing B-29. 574.593 km/hr

Speed over 5,000 km (U.S.A.)
Lt. Col. R. G Ruegg and crew. June 21st, 1946.
Boeing B-29. 428.123 km/hr

Carrying 15,000 kg

Altitude (U.S.A.)
Col. J. R. Waren and crew. May 11th, 1946.
Boeing B-29. 12,046 m

Greatest load carried to height of 2,000 m (U.S.A.)
Col. J. R. Waren and crew. May 11th, 1946.
Boeing B-29. 15,166 kg

The straight-line distance record (11,237 miles) is held by a Lockheed P2V Neptune, which flew from Australia to America in 1948. "The Truculent Turtle," as the record-breaker was named, is seen demonstrating J.A.T.O take-off during a 1949 visit to Europe.
"Flight" photograph.

Group II: Jet-powered (or jet-and-piston-engined) aircraft

Altitude (G.B.)
G/C J. Cunningham. March 23rd, 1948.
de Havilland Vampire I. 18,119 m

Speed at low level (U.S.A.)
Major R. L. Johnson, U.S.A.F. Sept. 15th, 1948.
North American F-86. 1,079.841 km/hr

Speed over 100 km (G.B.)
J. Derry. April 12th, 1948.
de Havilland D.H. 108. 974.0259 km/hr

Speed over 1,000 km (G.B.)
J. R. Cooksey. May 12th, 1950.
Gloster Meteor F.8. 822.256 km/hr

LIGHT AIRCRAFT

(Classified according to all-up weight)

Category 1 (Under 500 kg)

Distance in a straight line (Belgium)
A. Van Cotthem. August 21st, 1950.
Tipsy Belfair. 945.030 m

Altitude (France)
Rene Leduc. June 13th, 1949.
Leduc. 7.788 m

Speed over 100 km closed circuit (G.B.)
A. L. Cole. June 17th, 1950.
Comper Swift. 203.137 km/hr

Category 2 (500-1,000 kg)

Distance in a straight line (U.S.A.)
J. F. Mann. January 13th-14th, 1950
Meyers. 3,469.656 km

Altitude (U.S.A.)
Mrs. A. L. Branger. March 31st, 1950.
Piper Special. 7,469 m

Speed over 100 km closed circuit (G.B.)
R. R. Paine. June 17th, 1950.
Miles Hawk Speed Six. 310.345 km/hr

Speed over 1,000 km. (U.S.S.R.)
Yacov D. Forostenco. Sept. 6th, 1949.
Yak-18. 223.560 km/hr

Category 3 (1,000-1,750 kg)

Distance in a straight line (U.S.A.)
W. P. Odom. March 7th-8th, 1949.
Beechcraft Bonanza. 7,977.920 km

Speed over 100 km. closed circuit (G.B.)
J. N. Somers, June 17th, 1950.
Miles Gemini III. 271.084 km/hr

Speed over 1,000 km (Norway)
Capt. Jan Christie. March 22nd, 1950.
Caudron Simoun C-635. 223.076 km/hr

(*Continued on page 130*)

RECORD REVIEW . . .

Category 4 (1,750-3,000 kg)

Speed over 100 km closed circuit (G.B.)
Miss R. M. Sharpe. June 17th, 1950.
Vickers Supermarine Spitfire. 5B. 519.480 km/hr

Category 5 (3,000-4,500 kg)

Speed over 100 km closed circuit (G.B.)
P. G. Robarts. June 17th, 1950.
Vickers Supermarine Spitfire Trainer. 528.634 km/hr

CLASS C2 (Seaplanes and Flying Boats)

Closed circuit distance (Italy)
M. Stoppani and C. Tonini. May 27th-28th, 1937.
Cant Z.506. 5,200 km

Distance in a straight line (G.B.)
Capt. D. C. T Bennett and crew. Oct. 6th-8th, 1938.
Short-Mayo Mercury. 9,652.001 km

Altitude (Italy)
Lt. Col. N. di Mauro. Sept. 25th, 1939.
Caproni 161. 13,542 m

Maximum speed at low level (Italy)
F. Agello. Oct. 23rd, 1934.
Macchi C.72. 709.209 km/hr

Speed over 100 km (Italy)
G. Cassinelli. Oct. 8th, 1933.
Macchi C.72. 6293.370 km/hr

Speed over 1,000 km (Italy)
M. Stoppani and G. Gorini. March 30th, 1938.
Cant Z.509. 403.424 km/hr

Speed over 2,000 km (Italy)
M. Stoppani and G. Gorini. March 30th, 1938.
Cant Z.509. 396.464 km/hr

Speed over 5,000 km (Italy)
M. Stoppani and C. Tonini. May 27th-28th, 1937.
Cant Z.506. 308.424 km/hr

CLASS C3 (Amphibians)

Distance in a straight line (U.S.A.)
Brig. Gen. F. M. Andrews. June 29th, 1936.
Douglas YOA-5. 2,300.860 km

Altitude (U.S.A.)
Capt. B. Sergievsky. April 14th, 1936.
Sikorsky S-43. 7,605 m

Maximum speed at low level (U.S.A.)
Major A. P. de Seversky. Sept. 15th, 1935.
Seversky. 370.814 km/hr

Speed over 100 km (G.B.)
L. R. Colquhoun. July 22nd, 1950.
Vickers-Supermarine Seagull 1. 389.273 km/hr

Speed over 1,000 km (U.S.A.)
Capt. W. P. Sloan and Capt. B. L. Bostner. July 31st, 1939.
Grumman 0A-9. 299.461 km/hr

Speed over 2,000 km (Italy)
G. Burei and E. Rossaldi. May 6th, 1937.
Macchi C.94. 248.967 km/hr

CLASS D (Gliders)

Category 1 (Single-seaters)

Duration (France)
Guy Marchand. March 16th-18th, 1949.
Nord 2000. 40 hr 51 min

Distance in a straight line (U.S.S.R.)
Mlle. O. Klepikova. July 6th, 1939.
Rot Front 7. 749.203 km

Goal flight (U.S.S.R.)
P. Savtaov. July 31st, 1939.
Rot Front 7. 602.358 km

Goal flight with return to point of take-off (Sweden)
S. R. Laroy-Mansson. July 7th, 1950.
Weihe Se104. 390 km

Height above take-off point (Sweden)
Lt. Per Axel Persson. July 12th, 1947.
Weihe. 8,050 m

Absolute altitude (U.S.A.)
J. Robinson. Jan. 1st, 1949.
Ross-Stephens 1. 10,210.821 m

Speed over 100 km triangular course (Switzerland)
S. Maurer. July 22nd, 1948.
Moswey III. 69.6 km/hr

Category 2 (Multi-seaters)

Duration (Germany)
A. Bodecker and K. H. Zander. Dec. 9th-11th, 1938.
Kranich. 50 hr 26 min

Distance in a straight line (U.S.S.R.)
I. Kartachev. July 17th, 1938.
Stakhanovitz. 619.748 km

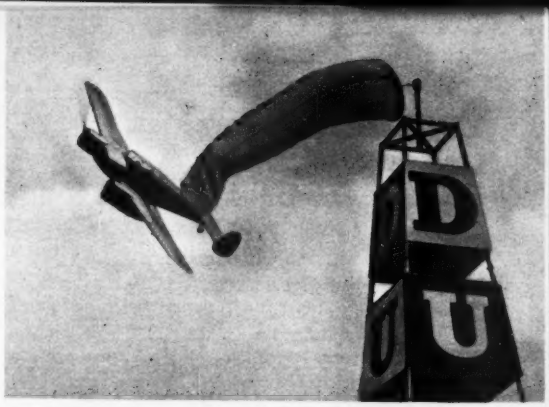
Distance returning to take-off point (U.S.S.R.)
I. Kartachev and V. Petrochenkova. June 12th, 1940.
Stakhanovitz. 416.070 km

Goal flight (U.S.S.R.)
I. Kartachev and V. Petrochenkova. June 19th, 1950.
Stakhanovitz. 495.020 km

Absolute altitude (U.S.A.)
Harland C. Ross and Georges Diebert. Jan. 27th, 1950.
Schweizer TG-3. 10,973 m

Height gained (U.S.A.)
Harland C. Ross and Georges Diebert. Jan. 27th, 1950.
Schweizer TG-3. 7,407 m

Speed over 100 km triangular course (U.S.A.)
W. G. Briegleb. Aug. 12th, 1949.
Briegleb BG8. 44.857 km/hr



The course for the 1950 King's Cup Race, held at Wolverhampton, was exactly 100 km; five competitors were able to claim light-aircraft records. Shown rounding a pylon is the Gipsy-powered Gemini (1,000-1,750 kg category) of J. N Somers, whose speed was 168 m.p.h.
"Flight" photograph.

CLASS G (Helicopters)

Duration returning to point of take-off (U.S.A.)
Majors Jensen and Dodds. Nov. 14th, 1946.
Sikorsky R-5A 9 hr 57 min

Closed-circuit distance (U.S.A.)
Majors Jensen and Dodds. Nov. 14th, 1946.
Sikorsky R-5A. 1,000 km

Distance in a straight line (U.S.A.)
Majors Cashman and Zins. May 22nd, 1946.
Sikorsky R-5A. 1,132.337 km

Altitude (U.S.A.)
Capt. H. D. Gaddis. May 21st, 1949.
Sikorsky S-52-1. 6,468 m

Maximum speed at 3 km altitude (U.S.A.)
H. E. Thompson. April 27th, 1949.
Sikorsky S-52-1. 208.494 km/hr

Speed over 100 km (U.S.A.)
H. E. Thompson. May 6th, 1949.
Sikorsky S-52-1. 197.545 km/hr

Speed over 1,000 km (U.S.A.)
Majors Jensen and Dodds. Nov. 14th, 1946.
Sikorsky R-5A. 107.251 km/hr

WOMEN'S RECORDS

CLASS C (Landplanes)

Distance in a straight line (U.S.S.R.)
V. Grisodoubova and Capt. P. Ossipenko. Sept. 24th-25th, 1938. 5,908.610 km

Altitude (France)
Mlle. Maryse Hilsz. June 23rd, 1936.
Potez 506. 14,310 m

Speed at low level (U.S.A.)
Miss Jacqueline Cochran. Dec. 17th, 1947.
North American P-51. 663.054 km/hr

Speed over 100 km (U.S.A.)
Miss Jacqueline Cochran. Dec. 10th, 1947.
North American P-51. 755.668 km/hr

Speed over 500 km (U.S.A.)
Miss Jacqueline Cochran. Dec. 29th, 1949.
North American P-51. 703.376 km/hr

Speed over 1,000 km (U.S.A.)
Miss Jacqueline Cochran. May 24th, 1948.
North American P-51. 693.780 km/hr

Speed over 2,000 km (U.S.A.)
Miss Jacqueline Cochran. May 22nd, 1948.
North American P-51. 720.134 km/hr

(Seaplanes)

Altitude (U.S.S.R.)
Lt. P. Ossipenko. May 22nd, 1937.
Seaplane *Canot Volant*. 8,864 m

Speed over 100 km (U.S.A.)
Miss C. Mowry and Miss E. MacCann. Dec. 9th, 1936.
Seaplane *Kitty Hawk*. 127.361 km/hr

CLASS D (Gliders)

Category 1 (Single-seaters)

Duration (France)
Mlle. Marcelle Choisnet. Nov. 17th-19th, 1948.
Air 100 sailplane. 35 hr 3 min

Distance returning to take-off point (France)
Mlle. Marcelle Choisnet. July 20th, 1950.
Air 100 sailplane. 203.150 km

Distance in a straight line (U.S.S.R.)
O. Klepikova. July 6th, 1939.
Rot Front 7 sailplane. 749.203 km

CLASS G (Helicopters)

Distance in a straight line (Germany)
Mlle. Hanna Reitsch. Oct. 25th, 1937.
Fw 61 V-1D. 108.974 km

PLACE-to-PLACE RECORDS

Cape Town-London (Great Britain).—A. Henshaw. February 7th-9th, 1939. Percival Mew Gull. 39 hr 36 min. 243.745 km/hr.

Berlin-New York (Germany).—A. Henke and R. von Moreau. November 28th-30th, 1938. Focke-Wulf F.W.200 Condor. 24 hr 56 min 12 sec. 255.499 km/hr.

Berlin-Tokyo (Germany).—A. Henke and R. von Moreau. November 28th-30th, 1938. Focke-Wulf F.W.200 Condor. 46 hr 18 min 19 sec. 192.308 km/hr.

Berlin-Hanoi (Germany).—A. Henke and R. von Moreau. November 28th-30th, 1938. Focke-Wulf F.W.200 Condor. 34 hr 17 min 27 sec. 243.011 km/hr.

Sydney-London (Great Britain).—F/O. A. E. Clouston and V. Ricketts. March 21st-26th, 1938. D.H.88 Comet. 130 hr 3 min. 130.777 km/hr.

Havana-Washington (United States).—W. W. Edmondson. November 27th, 1947. North American P-51. 3 hr 15 min 13 sec. 563.800 km/hr.

Copenhagen-London (Great Britain).—J. Zurakowski. April 4th, 1950. Gloster Meteor F.8. 1 hr 11 min 17 sec. 805.752 km/hr.

Cairo-London (Great Britain).—J. Cunningham. May 11th, 1950. D.H. Comet. 5 hr 39 min 2.7 sec. 621.026 km/hr.

Los Angles-New York (United States).—Col. W. H. Councill. January 26th, 1946. Lockheed P-80. 4 hr 13 min 26 sec. 934.926 km/hr.

New York-Los Angeles (United States).—Capts. Boyd L. Grubaugh and J. L. England. August 1st, 1946. Boeing B-29. 7 hr 28 min 3 sec. 528.828 km/hr.

New York-Berlin (Germany).—A. Henke and R. von Moreau. August 13th-14th, 1938. Focke-Wulf FW.200 Condor. 19 hr 55 min 1 sec. 320.919 km/hr.

New York-London (United States).—H. T. Merrill and J. S. Lambe. May 9th-10th, 1937. Lockheed Electra. 20 hr 29 min. 272.345 km/hr.

Washington-Havana (United States).—W. W. Edmondson. November 25th, 1947. North American P-51. 3 hr 37 min 28.6 sec. 506.092 km/hr.

Paris-Tananarive (France).—Genin and Robert. December 18th-21st, 1935. Caudron Simoun. 57 hr 35 min 21 sec. 151.908 km/hr.

Paris-Hanoi (France).—Andre Japy. November 15th-18th, 1936. Caudron Simoun. 50 hr 59 min 49 sec. 180.208 km/hr.

Paris-Saigon (France).—Mlle. Maryse Hilsz. December 19th-23rd, 1937. Caudron Simoun. 92 hr 36 min. 109.316 km/hr.

London-Valetta (Great Britain).—Lt. Cdr. W. R. MacWhirter, Lt. P. C. S. Chilton, Lt. D. A. Hook and Lt. D. W. Morgan. July 19th, 1949. Hawker Sea Furies. 3 hr 20 min 49 sec. 624.260 km/hr.

London-Cape Town (Great Britain).—S/L. H. E. Martin and S/L. E. C. Simore. April 30th-May 1st, 1947. D.H. Mosquito. 21 hr 31 min 30 sec. 449.400 km/hr.

London-Copenhagen (Great Britain).—J. Zurakowski. April 4th, 1950. Gloster Meteor F.8. 1 hr 5 min 5 sec. 871.344 km/hr.

London-Copenhagen-London (Great Britain).—J. Zurakowski. April 4th, 1950. Gloster Meteor F.8. 2 hr 29 min 8 sec. 770.202 km/hr.

London-Darwin (Great Britain).—A. Cdre. N. H. d'Aeth and S/L. J. S. Aldridge. August 21st-23rd, 1946. Avro Lancaster *Aries*. 45 hr 35 min. 305.009 km/hr.

London-Khartoum (Great Britain).—S/L. J. C. T. Downey, S/L. A. D. Frank and S/L. J. McKay. October 20th-21st, 1950. Avro Lincoln *Aries*. 14 hr 23 min 10 sec. 342.780 km/hr.

London-Melbourne (Great Britain).—C. W. A. Scott and T. Campbell Black. October 20th-23rd, 1934. D.H.88 Comet. 71 hr 0 min 18 sec. 255.947 km/hr.

London-Sydney (Great Britain).—F/O. A. E. Clouston and V. Ricketts. March 15th-19th, 1938. D.H.88 Comet. 80 hr 56 min. 209.712 km/hr.

London-Cairo (Great Britain).—J. Cunningham. April 24th, 1950. D.H. Comet. 5 hr 6 min 58.3 sec. 686.558 km/hr.

London-Paris (Great Britain).—S/L. T. S. Wade. May 13th, 1949. Hawker P.1052. 20 min 37⅘ sec. 994.97 km/hr

London-Rome (Great Britain).—J. Cunningham and P. O. Bugge. March 16th, 1950. D.H. Comet. 1 hr 59 min 37 sec. 719.730 km/hr.

London-Karachi (Great Britain).—S/L. Neville Duke. May 12th, 1949. Hawker Fury. 15 hr 18 min 36 sec. 412.170 km/hr.

London-Wellington (Great Britain).—A. Cdre. N. H. d'Aeth and S/L. J. S. Aldridge. August 21st-24th, 1946. Avro Lancaster *Aries*. 59 hr. 50 min. 313.270 km/hr.

Gibraltar-London (Great Britain).—G/C. A. C. P. Carver. September 19th, 1949. D.H. Hornet 3. 2 hr 30 min 31 sec. 701.492 km/hr.

Rome-Rio de Janeiro (Italy).—Attileo Bisco and Amedeo Paradisi. January 24th-25th, 1938. Savoia S.79. 41 hr 32 min. 221.966 km/hr.

Rome-Addis Abbaba (Italy).—M. Lualdi and G. Mazzotti. March 6th-7th, 1939. Fiat B.R.20L. 11 hr 25 min. 390.971 km/hr.

Rome-London (Great Britain).—J. Cunningham and P. O. Bugge. March 16th, 1950. D.H. Comet. 1 hr 58 min 4 sec. 729.530 km/hr.

Tokyo-London (Japan).—Masaaki Iinuma and Kenji Tsukakoshi. April 6th-9th, 1937. Mitsubishi *Karigane*. 94 hr 17 min 56 sec. 162.854 km/hr.

Wellington-London (Great Britain).—F/O. A. E. Clouston and V. Ricketts. March 20th-26th, 1938. D.H.88 Comet. 140 hr 12 min. 134.306 km/hr.

BRITISH NATIONAL RECORDS

LANDPLANE

Speed over 3 km.—G/C. E. M. Donaldson, Gloster Meteor (2 Rolls-Royce Derwent), 991 km/hr (616 m.p.h.), Sept. 7th, 1946.

Speed over 100 km.—S/L. J. D. Derry, D.H.108 (D.H. Goblin), 974.0259 km/hr (605.23 m.p.h.). April 12th, 1948.

Speed over 100 km (piston-engined aircraft).—Frank Murphy, Hawker Sea Fury T.20 (Bristol Centaurus 18), 608.108 km/hr (377.86 m.p.h.). July 22nd, 1950.

Altitude.—G/C. J. Cunningham, D.H. Vampire (D.H. Ghost), 18,119 m (59,445ft). March 23rd, 1948.

Distance in Straight Line.—S/L. R. Kellett, F/L. R. Gething and P/O. M. L. Caine, Vickers Wellesley (Bristol Pegasus), Ismailia (Egypt) to Darwin (Australia), 11,520.421 km (7,158.467 miles). Nov. 5th-7th, 1938.

Women's Record

Speed over 100 km.—Miss R. M. Sharpe, Vickers Supermarine Spitfire 5B (Rolls-Royce Merlin 55), 519.480 km/hr (322.79 m.p.h.). June 17th, 1950.

SEAPLANE

Speed over 3 km.—F/L. G. H. Stainforth, Supermarine S.6B (Rolls-Royce "R"), 655 km/hr (406.991 m.p.h.). November 29th, 1931.

Speed over 100 km.—F/L. J. N. Boothman, Supermarine S.6B (Rolls-Royce "R"), 551.8 km/hr (342.9 m.p.h.). September 9th, 1931.

Distance in Straight Line Without Landing.—Capt. D. C. T. Bennett and I. H. Harvey, Short Mercury (4 Napier Rapier), Dundee (Scotland) to Orange River (S. Africa), 9,652 km (5,997.752 miles). Oct. 6th-8th, 1938.

Women's Record

Altitude.—Lady Mary Heath, Short Mussel II (Cirrus II), 3,889 m (12,759.809ft). July 15th, 1928.

ROTORPLANE

Speed over 3 km.—S/L. B. H. Arkell, Fairey Gyrodyne (Alvis Leonides), 200.0637 km/hr (124.31 m.p.h.), June 28th, 1948.

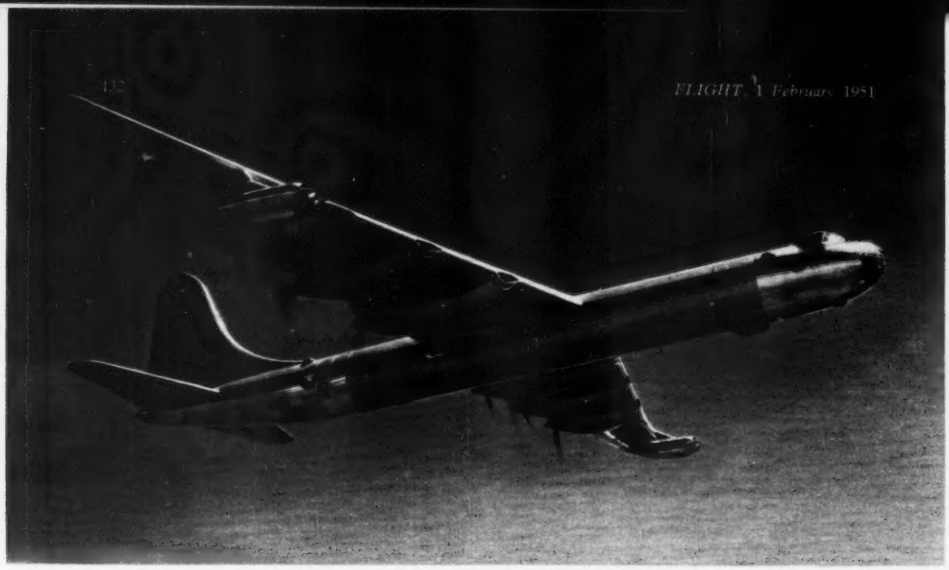
POINT-TO-POINT

Of the ten British national point-to-point records, eight are included in the international records in the adjacent column. Details of the remaining two are as follows:—

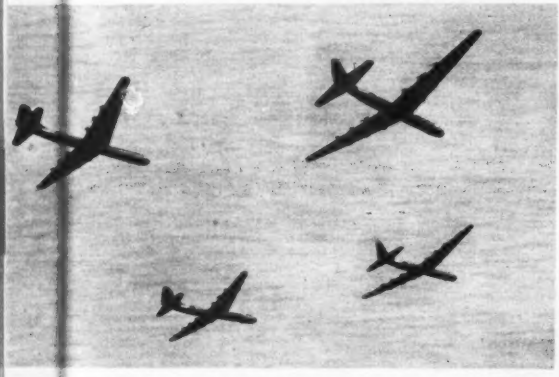
London-Paris.—S/L. T. S. Wade, Hawker P.1052 (Rolls-Royce Nene 2), 20 min 27⅘ sec, 994.97 km/hr (618.217 m.p.h.). May 12th, 1949.

London-Gibraltar.—F/L. H. Peebles, D.H. Hornet 3 (2 Rolls-Royce Merlin 130/131), 3 hr 3 min 16 sec, 575.47 km/hr (357.565 m.p.h.).

One of the few recent British records to be established was in the amphibian class: the Supermarine Seagull (L. Colquhoun) is seen completing the 100-km course at Leeds last July. Its speed was 242 m.p.h.



That the U.S.A.F.'s Convair B-36 " global " bomber has a certain stately grace, notwithstanding its vast bulk, is proved by this recent aerial view. Six Pratt and Whitney Wasp Major piston engines and four General Electric J-47 turbojets provide power. The span is 230ft and the length 162ft.

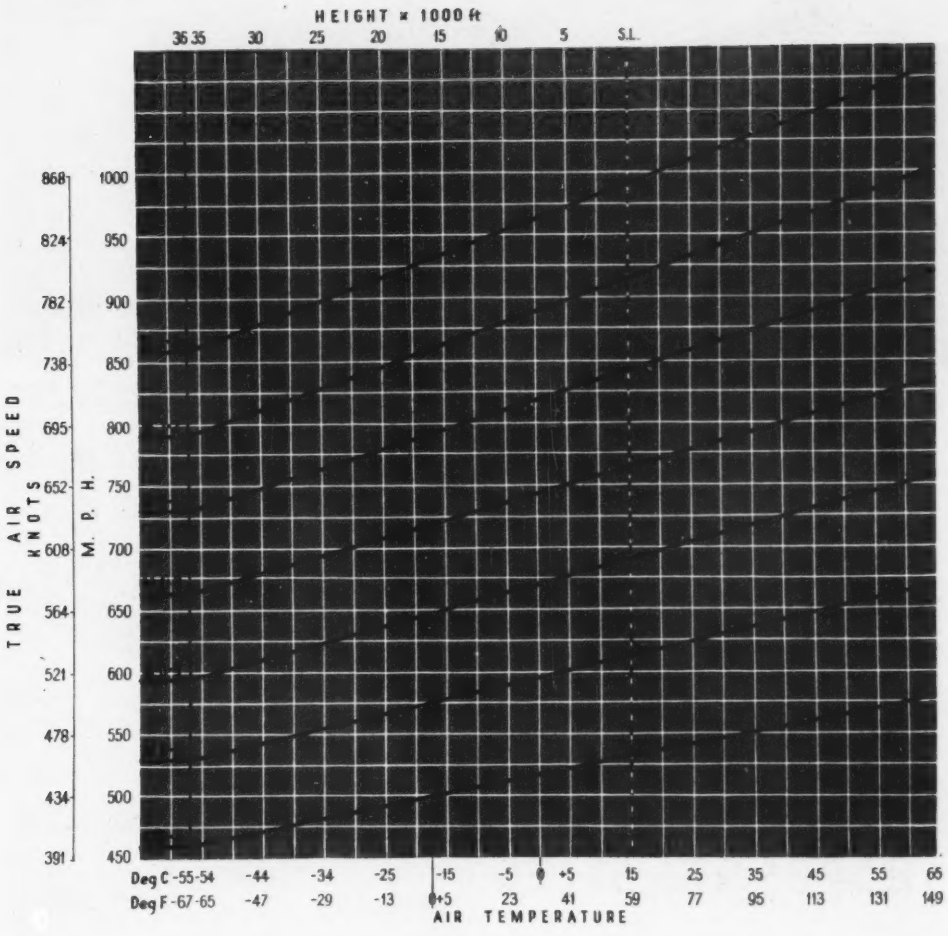


B-36

A flight of early-type B-36s, without auxiliary jets. All such machines (B-36A and B) are being converted to the B-36D standard.

The " Flight " photograph below shows a visiting B-36 crew (named in last week's issue), and allows study of nose details on their aircraft.

Checking the sights of one of the B-36's remotely-controlled barbettes, housing two 20 mm guns, at Carswell Air Force Base, near Fort Worth.



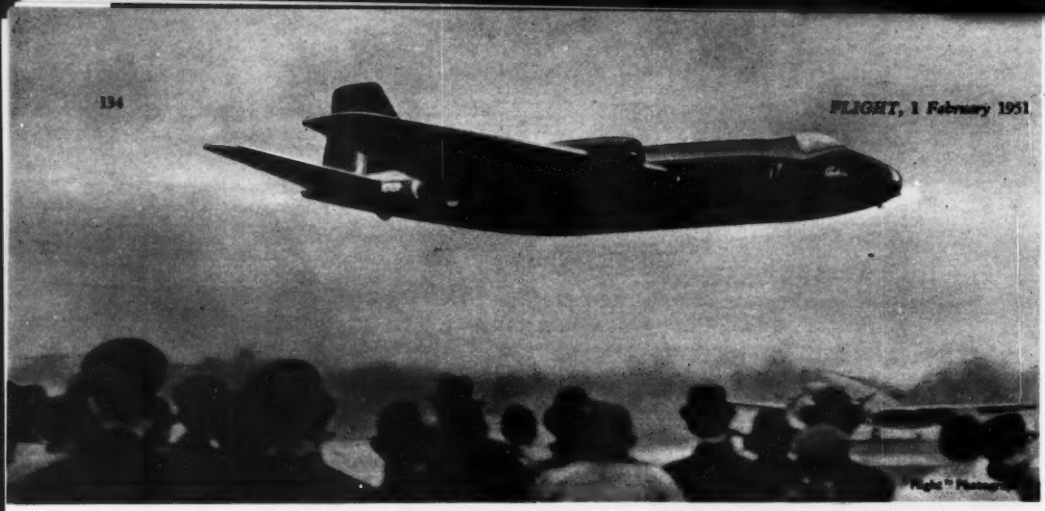
Mn, T and T.A.S.

Another "Flight" Conversion Table : Mach Number to T.A.S. at Given Temperature

So well have the graphs of atmospheric factors published in the September 7th, 1950, issue of *Flight* been received that, in response to many requests, we have devised an addition to the range. This permits a true air speed to be derived from a Mach number at a given air temperature.

Mach number is, of course, a direct function of temperature, and one of the drawbacks of the I.C.A.N. scale is that it has a datum sea-level temperature of but 15 deg C/59 deg F. Whilst not exactly a common occurrence, a sea-level ambient of 30 deg C (86 deg F) is occasionally experienced even in England, and in such conditions, the T.A.S. equivalent of a given Mach number departs markedly from I.C.A.N. data. In fact, as may be seen from the graph, a Mach number of 0.7 at I.C.A.N. sea-level is a T.A.S. of 532 m.p.h., whereas, at a temperature of 30 deg C, the equivalent T.A.S. is 542 m.p.h.

To take a further example, a fighter aircraft with a limiting Mach number of, say, 0.95, will be capable of a true air speed of 727 m.p.h. in the normal temperate climate of England—with which the I.C.A.N. scale is in good agreement—but the same aircraft operating at, say, Karachi or Hong Kong, where the sea-level ambient might well be *circa* 55 deg C (131 deg F), gains in *actual* speed no less than 56 m.p.h., for at 55 deg C a Mach number of 0.95 equals 783 m.p.h.

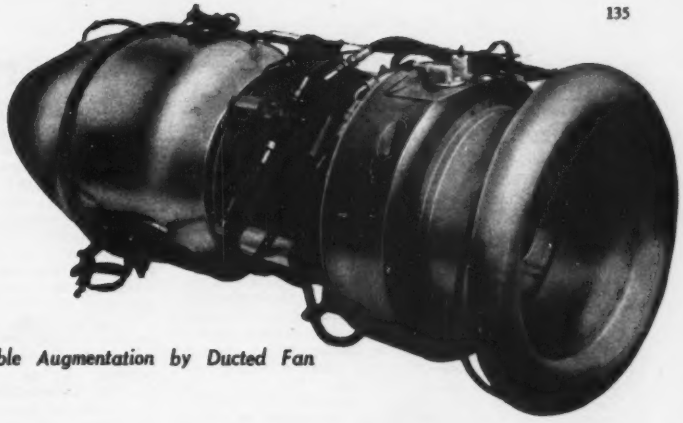


Intimate glimpse of the English Electric Canberra B.2 at Biggin Hill, after the naming ceremony by Mr. Menzies, the Australian Prime Minister, recorded in "Flight" last week. W/C. Roland Beamont was, in Mr. Menzies' words, "the presiding genius" on this memorable occasion.

A Douglas C-124 transport, one of three of these huge and husky handmaidens (as their countrymen might describe them) of the Convair B-36 bombers which lately visited Lakenheath. The engines are Pratt and Whitney Wasp Major R-4360s.

SHAPES and SIZES

The three views adjacent depict de Havilland Chipmunks of No. 18 Reserve Flying School, Fairoaks. These dainty little primary trainers were impatiently awaited by the V.R. "Tiger-bashers" and now, in substantial numbers, fulfil the most sanguine hopes entertained for them



The prototype Aspin I, rated for take-off at 440 lb thrust, has successfully completed a 1,000 hour test.

ASPIN 1

Turboméca Jet Unit with Variable Augmentation by Ducted Fan

WITH even the most modern airscrew, propulsive efficiency begins to fall fairly rapidly at flying speeds in excess of about 440 m.p.h., while the propulsive efficiency of the thermal jet is much inferior to that of the airscrew until a flying speed of about 550 m.p.h. is attained. To power the larger airliners and transports of the future (which are the aircraft most likely to be operated at speeds between these limits) a jet unit with ducted-fan augmentation, i.e., one intermediate to the turbojet and the turboprop, would appear to deserve serious consideration. This type has been studied and developed in England by Metropolitan-Vickers and in France by Rateau. More recently a second French unit, the Turboméca Aspin I has concluded a successful test. It is, however, a much smaller unit than either of its precursors.

In all systems of air propulsion the applied force F (thrust) is equivalent to the acceleration of an air mass: $m\ (w-V)$

where m = air mass
w = efflux velocity
V = intake velocity (aircraft speed)

The energy E imparted to the air is equal to the difference between the respective intake and efflux kinetic energies and is expressed:—

$$E=\tfrac{1}{2}m\ (w^2-V^2)$$

from which:

$$E=\tfrac{1}{2}F\ (w+V)$$

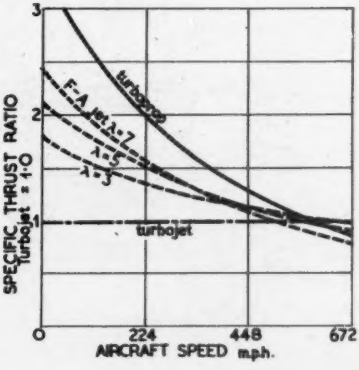
With a given expenditure of energy E, any increase of the applied force F implies a diminution of the factor $(w+V)$ and this, in practice, means a reduction of efflux velocity w since intake velocity V is regarded as constant for any particular evaluation. However, w must remain higher than V and any reduction of w entails an increase of mass m if the resultant thrust F is to be maintained. The aim, therefore, is to utilize the greatest possible air mass intake, and an efflux velocity only slightly higher than the aircraft speed.

On the basis of this reasoning Turboméca have so designed the Aspin I that part of the energy is used to drive an axial fan to induce an excess flow of air which serves to dilute and lower the velocity of the propulsive jet. A diffusing entry duct slows down the intake air to a velocity conducive to the good functioning of the fan. If the aircraft speed rose above 550 m.p.h. and approached sonic values the efficiency of the fan would fall away and augmentation cease. In that range of aircraft speeds, however, the propulsive efficiency of the pure jet is the best available.

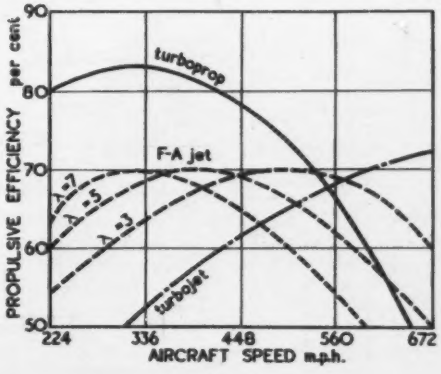
Assuming an identical central assembly—compressor, combustion system and turbine—the same air mass flow and the same consumption of fuel, an estimation of the fan-augmented turbine unit relative to the turbojet and the turboprop can be made. The relationship varies with aircraft speed and also with the dilution ratio λ of the augmented jet. This is the ratio of the secondary air mass flow to the primary air mass flow and curves are drawn on the graphs showing specific thrust and propulsive efficiency for λ values of 3.0, 5.0 and 7.0.

As regards propulsive efficiency, the turboprop would appear to be superior to the augmented jet up to an aircraft speed of 540 m.p.h. If the ratio of dilution can be varied, it becomes possible to arrange for the maximum propulsive efficiency of an augmented jet to be attained at a desired aircraft speed. It should be noted that this speed may be considerably higher than that at which the airscrew functions at its optimum efficiency. In short, the turboprop is markedly superior only at speeds up to, say, 350 or 400 m.p.h. The rate of decrease of thrust with increase

Comparative curves of specific thrust plotted against aircraft speed. Three ratios of dilution are shown for the augmented jet.



Propulsive efficiencies as a function of aircraft speed for the three types of turbine power units.



ASPIN 1 . . .

of aircraft speed is less rapid with an augmented jet than with an airscrew and consequently the throttle setting to effect a take-off can be somewhat lower.

At very high aircraft speeds, and approaching sonic speed, the propulsive efficiency of the turbojet is superior, but at speeds up to about 575 m.p.h. the augmented jet shows to advantage. Furthermore, the secondary flow lends itself perfectly to the installation of auxiliary fuel-burners which, in the manner of the afterburner for the turbojet, can furnish an increase of thrust for take-off or emergency.

Between these nominal limits of 400 m.p.h. and 575 m.p.h. would appear to be the field of application for the augmented jet. It must be remembered that it possesses the incidental advantages that accrue from the elimination of the airscrew: reduced weight, absence of vibration, less noise, simpler installation, wide latitude of location and grouping, and lower and lighter aircraft undercarriage.

The Turboméca unit, Aspin I, embodies the variable circulation system developed by M. Szydlowski in which the ratio of augmentation is controllable to establish optimum propulsive efficiency over a range of aircraft speeds. Variable-incidence shutter vanes, located ahead of the axial fan and interconnected with the turbine speed-control, regulate the proportion absorbed by the fan of the available energy developed by the turbine. This method of control enables substantial variation to be effected rapidly without the need to overcome the inertia of the rotating assembly. Despite the fact that it is coupled to the fan through the medium of a double reduction gear the turbine can, if necessary, be suddenly unloaded. Furthermore, it resolves the major problem of starting that has handicapped other fan-augmentation projects. With the shutter vanes sufficiently closed, the torque resistance is substantially lowered and a conventional electric starter-motor is adequate for the task. Thus the shutter vanes furnish a novel method of control which, with simultaneous regulation of fuel supply, gives an effective adjustment of performance to suit differing flying conditions. In effect, it is analogous to controlling the pitch of an airscrew.

Referring to the sectioned drawing, it will be seen that after passing the axial fan the air is divided into two separate flows. The primary flow is to the centrifugal compressor and thence to the annular combustion chamber. Here it receives the energy released from the fuel and is then expanded through the two-stage turbine and discharged as a propulsive jet through a diffusing efflux duct. The design of this duct will determine the static pressure behind the turbine and consequently, to some degree, the division of energy between the axial fan and the jet. It offers, therefore, the possibility of modifying the performance characteristics of the unit to meet specific applications.

Downstream of the axial fan, the secondary flow is accelerated in a duct enshrouding the turbine unit and leading to the orifice of the efflux duct to effect a mixing with the primary flow.

To realize the optimum conditions of operation there is co-ordinated control of the two variables, rate of fuel supply and position of the shutter vanes. Two differing regimes, economical cruising and flight in circumstances calling for rapid manœuvre, may be taken to indicate how this is effected. The control shaft carries actuation cams and is permitted both rotative and axial movement. In the first case, the control lever is turned through an arc to establish a speed of rotation (which is maintained constant by a centrifugal governor) and to adjust the shutter vanes to give the best specific rate of fuel consumption. For the second condition, depression of a control button brings into operation a hydro-electric servo-motor which moves the control shaft axially and thus ensures that speed of rotation is held to maximum by controlling the action of the centrifugal governor. Rotative movement of the control lever then solely influences the position of the shutter vanes, so making possible a rapid variation of thrust.

Starting is effected at the control condition for economical cruising. As long as the speed of rotation is less than 70 per cent of the maximum, the shutter vanes remain closed, the centrifugal governor is ineffectual and the fuel supply is regulated solely by movement of the control lever. Only at rotational speeds in excess of 70 per cent of maximum does the simultaneous control of speed and shutter vane movement come into operation.

The prototype Aspin I unit illustrated has the following characteristics:—

Max. thrust	440 lb	(200 kg)
Specific fuel consumption	0.628 lb/lb/hr	(0.628 kg/kg/h)
Weight	264 lb	(120 kg)
Max. diameter	23.6 in	(0.600 m)

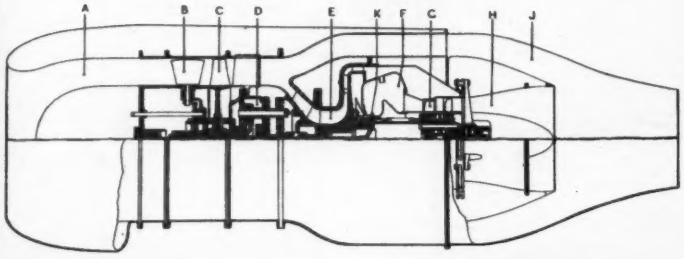
In general design the unit follows Turboméca practice, as exemplified in the Piméné turbojet and Artouste turboprop. It incorporates the unique "centrifugal injection" system in which the fuel, supplied along the main shaft, is atomized and projected into the annular combustion chamber through radial holes in a thrower flange.

Under the control of the French Air Ministry, the Aspin I was submitted to a 150-hr test at the take-off rating of 200 kg thrust under I.C.A.O. conditions. On its successful conclusion, the unit was officially examined and, being found in perfectly satisfactory condition, the test was continued for a further 850 hr at continuous maximum rating of 180 kg thrust. After 674 hr the casing of the revolution counter drive was damaged as a consequence of the fracture of the starter ratchet. This component was renewed and the opportunity was taken to change the igniter plug. These were the only items replaced throughout the test during which the turbine was running at speeds from 33,500 to 36,500 r.p.m.

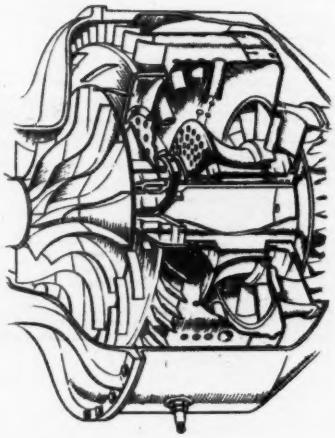
At the end of the 1,000-hr test the performance of the unit was reported to be identical with that at the commencement. It was completely dismantled for official examination and found to be in excellent condition. From the experience gained in the test certain development modifications are to be made and it is confidently expected that the take-off rating will be raised from 200 kg to 220 kg.

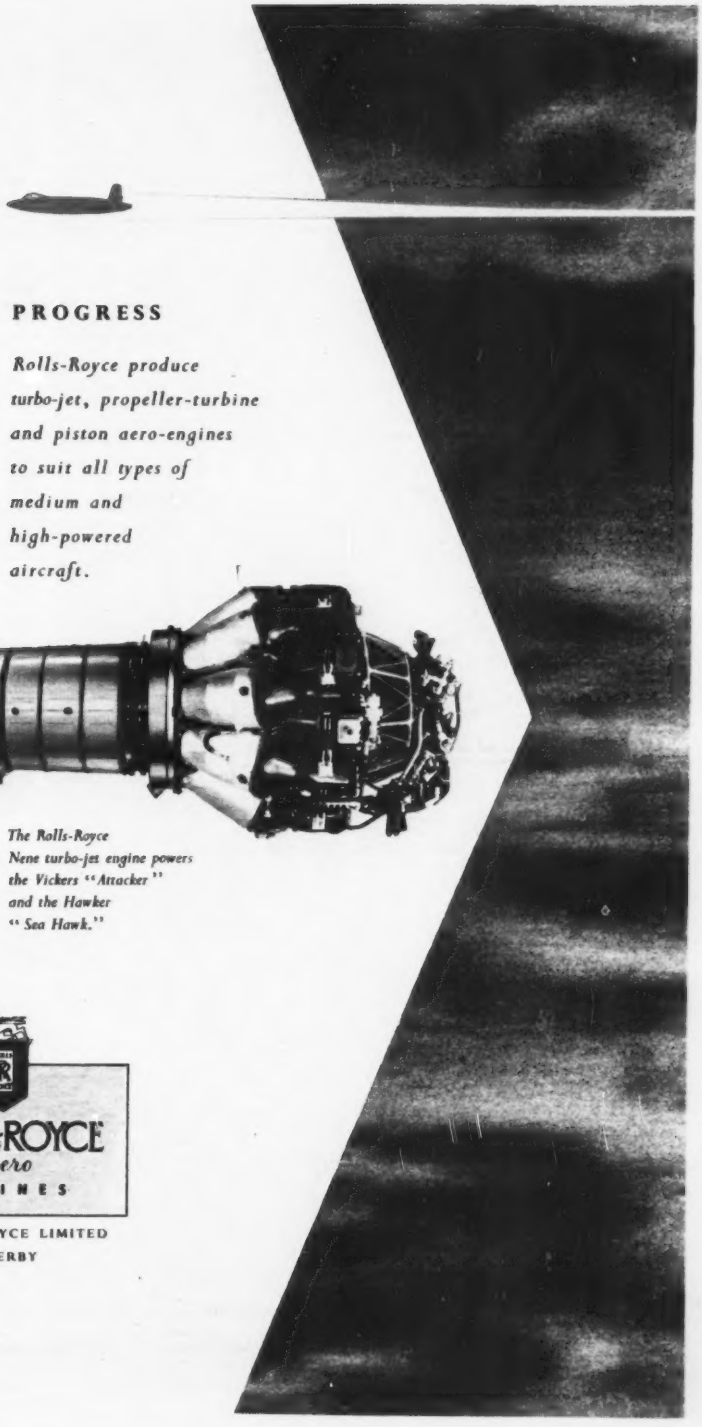
Part-sectional diagram of the "variable circulation" augmented unit.

A = Entry duct.
B = Shutter vanes.
C = Axial fan.
D = Fan reduction-gear.
E = Centrifugal compressor.
F = Annular combustion chamber.
G = Two-stage turbine.
H = Efflux duct.
J = Secondary-flow duct.
K = Centrifugal fuel-atomizer.



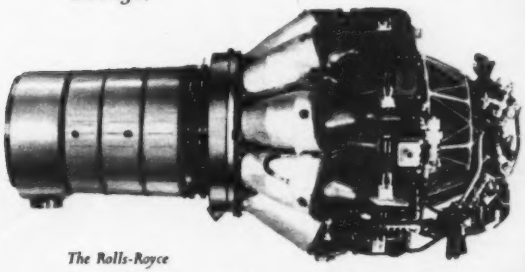
Detail showing arrangement of the Turboméca "centrifugal injection" fuel system.





PROGRESS

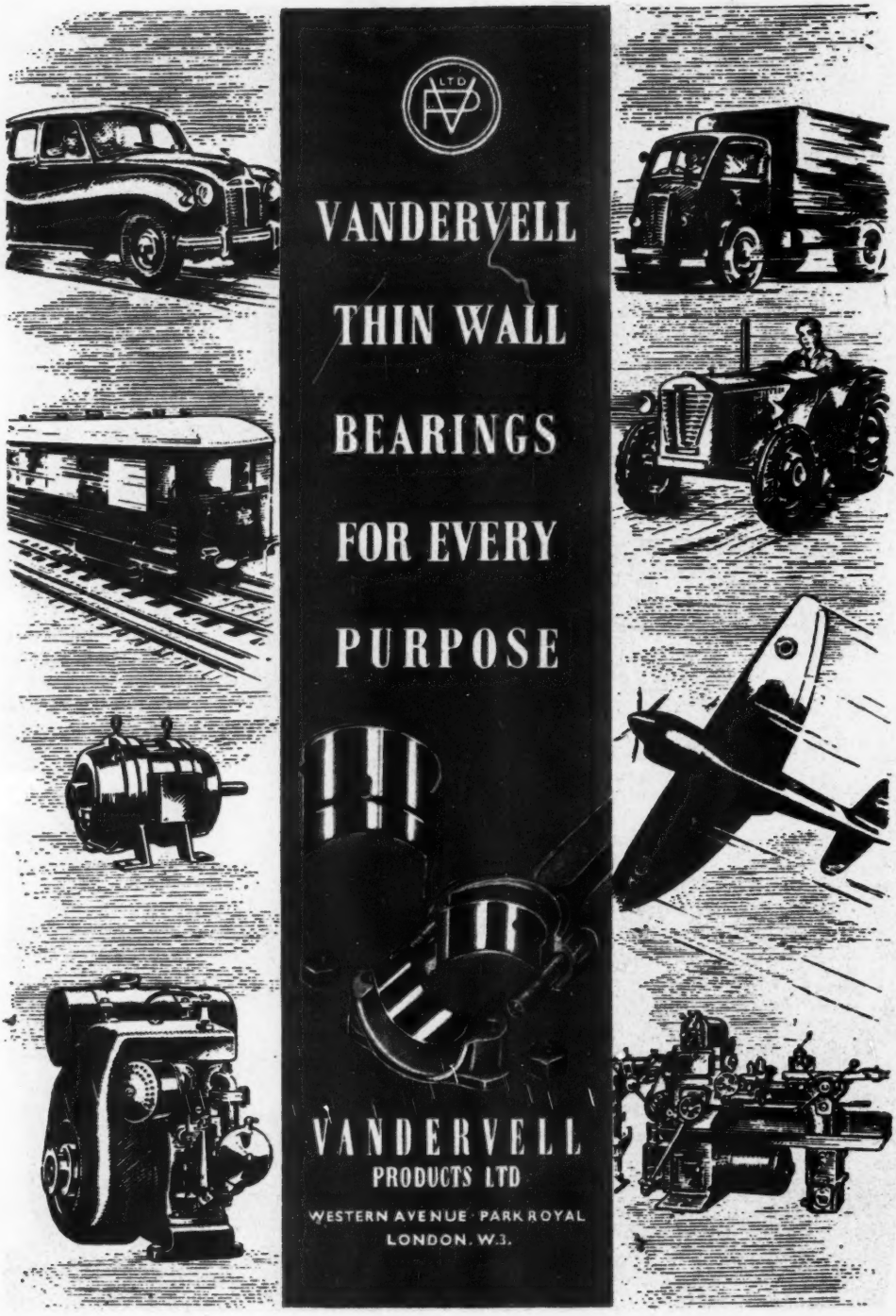
Rolls-Royce produce turbo-jet, propeller-turbine and piston aero-engines to suit all types of medium and high-powered aircraft.



The Rolls-Royce Nene turbo-jet engine powers the Vickers "Attacker" and the Hawker "Sea Hawk."

ROLLS-ROYCE *Aero* ENGINES

ROLLS-ROYCE LIMITED
DERBY


LTD
VANDERVELL
THIN WALL
BEARINGS
FOR EVERY
PURPOSE
VANDERVELL
PRODUCTS LTD
WESTERN AVENUE · PARK ROYAL
LONDON. W.3.

A CALL for ACTION

ADDRESSING shareholders at the annual meeting of the Hawker Siddeley Group in London last week, Mr. T. O. M. Sopwith (chairman) called for a realistic understanding of the present crisis, and the consequent urgent need for rearmament. As Britishers, he said, the directors of such a company as his had a moral responsibility to speak their minds on public issues.

"If the situation deteriorates—and it may deteriorate rapidly—are we as a nation and a Commonwealth prepared?" asked Mr. Sopwith. Had the R.A.F. and Commonwealth air forces the defensive strength they required to preserve the security of our peoples? The answer was "no."

His Majesty's Government, and those of our Allies, had planned major increases in our fighting strength. Big programmes were under consideration; initial orders had been placed. But aircraft in sufficient numbers could not be built overnight.

The Hawker Siddeley Group had done everything possible to put itself in readiness. It had built up its machine tools and even gone abroad to buy some. Heavy press and rolling equipment was available to all companies in the Group and the design and development staffs were ensured of having the most up-to-date equipment.

New and revolutionary aircraft and engines, many of which were still secret, had been developed in collaboration with the Government. But they were prototypes—ones and twos—where, as a nation and a Commonwealth, we needed thousands, many thousands. The day of talk about rearmament, said Mr. Sopwith in conclusion, was over—"the day of action is here."

Mr. T.O.M. Sopwith.

Employing 38,000, the Hawker Siddeley Group is the world's largest aircraft organization. Its member-companies, and some of their main products, are as follows: Gloster Aircraft (Meteor); Hawker Aircraft (Sea Fury, Sea Hawk, P.1081); A. V. Roe (Shackleton four-engined bombers, Delta research aircraft); Armstrong Whitworth (Meteor N.F.11); Avro Canada (Canuck fighter and Orenda turbojet); Armstrong Siddeley (Sapphire turbojet, Python and Double Mamba turboprop); A. W. Hawkesley (Avon turbojets under licence); High Duty Alloys; and Air Service Training.

CONTROL-CHAIN PATENTS

IN *Flight* of January 18th there appeared a brief description of a device for preventing the accidental reversal of control-chains during installation in aircraft. We are asked to state that the invention was the joint work of Mr. Raddings and Mr. P. Langley Pearse and was patented jointly in their names.

OPPORTUNITY FOR YOUTH

THE S.B.A.C. deserve congratulation on a new publication, *Your Future in Aircraft Engineering*, which sets out very clearly and concisely the opportunities which the aircraft industry offers to young men.

After a foreword by Mr. W. T. Gill (Rolls-Royce, Ltd.), president of the S.B.A.C., the guide goes on to explain the various classes of apprenticeship (trade, engineer, student) and the spheres of activity they cover. University scholarships and S.B.A.C. educational grants are also discussed, and examples are given—mainly by some excellent photographs—of the conditions under which young men may expect to work and spend their leisure time.

Your Future in Aircraft Engineering is being widely distributed in schools, but parents may obtain copies, free, on application to The Technical Secretary, Society of British Aircraft Constructors, Summit House, Langham Place, London, W.C.1.

REWARDS FOR MERIT: Mr. W. R. Verdon Smith, joint assistant managing director of the Bristol Aeroplane Co. Ltd., presenting his own prize to S. B. Chubb at the annual apprentice prize-giving held recently. Winners of the two other directors' prizes for meritorious performances by those who completed their apprenticeships in 1950 were D. W. B. Hatch (Sir Stanley White's prize)—second from right—and G. J. Faulkener (Mr. N. Rowbotham's prize)—right. Also in the picture are Mr. J. E. Attwood, chairman of the Education Committee, and Mr. H. Teasdale, apprentice school principal (second and third from left.)

S/L BENNETT-BAGGS RETIRES

VERY well known and always popular in the industry, S/L J. L. N. Bennett-Baggs is going to be sadly missed from aeronautical gatherings: continued ill-health has at last compelled his retirement from the boards of Blackburn and General Aircraft, Ltd., and its subsidiaries. During the First World War he transferred from the Army to the R.F.C., and has been in aviation ever since. Until 1931 he was chief test pilot to the important companies which formed the nucleus of the present Hawker-Siddeley Group; he then joined the Blackburn Aeroplane and Motor Co., Ltd., as the Brough firm was known at the time. S/L Bennett-Baggs was the director responsible for sales and liaison, and for a time was in control of the company's various flying schools.

S/L Bennett-Baggs.

THREE NEW D.H. DIRECTORS

THREE new directors have been appointed to the board of the de Havilland Aircraft Co., Ltd. They are Mr. A. F. Burke, managing director of the de Havilland Engine Co., Ltd., who joins Major F. B. Halford to strengthen the representation of the engine company on the aircraft company's board; Mr. H. Povey, general production manager, who is appointed in recognition of the greatly increased importance of the production side in the modern aircraft industry; and Mr. C. S. Thom, business manager and responsiblie to Mr. St. Barbe since the early nineteen-thirties for the creation and maintenance of the sales organization. Mr. Thom joins the board to strengthen the world marketing-organization of the de Havilland Enterprise.

FORTHCOMING EVENTS

Feb.	1.	British Institution of Radio Engineers (Scottish Section): "Multi-station V.H.F. Systems using Frequency Modulation," by W. P. Cole, B.Sc. and E. G. Hamer, B.Sc., A.M.Brit. I.R.E.
Feb.	1.	R.Ae.S. (Portsmouth): Film: "Stainless Steels."
Feb.	2.	R.Ae.S. (Glos. and Cheltenham): "Gliding," by P. A. Wills, C.B.E.
Feb.	3.	British Interlanetary Society: "Interolanetary Orbits," by Dr. I. G. Porter, Ph.D., F.R.A.S.
Feb.	5.	R.Ae.S. (Derby): "Pressurizing and Air-Conditioning," by W. M. Widgery, F.R.Ae.S.
Feb.	5.	R.Ae.S. (Halton): "Aerodynamics Division of the N.P.L.," by A. Page, F.R.S., F.I.Ae.S., F.R.Ae.S.
Feb.	7.	R.Ae.S. (Luton): "Interplanetary Travel," by A. Clark, B.Sc.
Feb.	7.	Royal United Service Institution: "Flying-boats in War," by A. V-M. P. H. Mackworth, C.B., C.B.E., D.F.C.
Feb.	10.	Royal Navy v. R.A.F. Rugby, Twickenham.
Feb.	12.	Institute of Transport: Brancker Memorial Lecture—"Economic Aspects of Airline Operation," by Peter G. Masefield, M.A. (Eng.), F.R.Ae.S., A.F.Inst.A.E., G.Inst.Mech.E., M.Inst.T.
Feb.	13.	R.Ae.S. Section Lecture: "Derivation and Estimation of Aerodynamic Loads," by D. J. Lambert.
Feb.	14.	R.Ae.S. (Brough): "Aero Engines," by A. Cdre. F. R. Banks, C.B., O.B.E.
Feb.	14.	R.Ae.S. (Preston): "Testing Aero-engines and Power Plants," by A. C. Lovesey, O.B.E., B.Sc., F.R.Ae.S.
Feb.	14.	R.Ae.S. (Bristol): "Civil Engineering and Aeronautics," by A.G. Pugsley, O.B.E., D.Sc., F.R.Ae.S.

VIBRATIONS in HELICOPTERS

A Symposium at the Royal Aeronautical Society

FOUR PAPERS were read at a symposium on "The practical Approach to Vibrations in Helicopters" arranged by the Helicopter Association of Great Britain and held in the library of the Royal Aeronautical Society last Saturday, January 27th. The chairman, Mr. N. E. Rowe, C.B.E., D.I.C., B.Sc., A.C.G.I., F.R.Ae.S., opened the meeting, which comprised four short papers, twelve six-minute contributions, and an open discussion period. The papers summarized herewith are: Operational Aspects of Helicopter Vibration, *by A. McClements, A.R.T.C., A.M.I.Mech.E.;* A Survey on the Practical Approach to Characteristic Vibration Sources in Helicopters, *by J. S. Shapiro, Dipl. Ing., A.F.R.Ae.S.;* Measurement of Vibrations, *by Dr. G. E. Bennett, B.Sc., Ph.D., F.Inst. P.;* Airworthiness and the Presence of Vibrations, *by R. H. Warde, A.M.I.Mech.E.*

OPERATIONAL ASPECTS

INTRODUCING his lecture, Mr. McClements (Ministry of Supply) said: "The helicopter as we know it is a good example of a potential vibration-producing machine. It has in it the means for providing vibratory frequencies similar to those which we meet in fixed-wing aircraft and, in addition, it can throw up periodic disturbances having much lower frequencies. With this in mind it will be easy to appreciate that the vibrations produced in a helicopter can be a major source of worry to the operator unless they are carefully kept under control.

"To the helicopter operator, vibratory disturbances mean possible structural failure from fatigue, and probable difficulty in the protection of equipment from the lower-frequency disturbances. In addition, vibratory sensations have to be contended with in respect of both passengers and crew. Many of these sensations come within the aural frequency band; they are all within the frequency range which can be felt, and the lower frequency displacements originating from the main rotor may be seen and followed visually. These sensations, if excessive, will result in physical fatigue and discomfort; further, they are not conducive to safety. These points, and many others, are not merely theoretical postulations, but, as most of us know from experience, they are practical considerations which must be dealt with."

Mr. McClements then went on to discuss some of the aspects of helicopter vibration which appeared to him to be operationally important; he did so under the broad headings of "Noise" and "Mechanical Vibration." He said that, in practice, a "noisy" helicopter would almost certainly cause annoyance to passengers through difficulty in carrying on conversation, and perhaps by headaches and subsequent ringing in the ears. The effects on crew—namely, physical fatigue, irritability and perhaps temporary loss of hearing—might be more important because safety was dependent on crew well-being and economy in crew utilization. Another aspect of helicopter noise which might be very important in the future was the external-noise level. It was visualized that helicopters would fly into the centres of built-up areas and thus, to the man in the street, they might well be a much greater source of annoyance than the aircraft which confined itself to airfields.

Stating that the human ear has an approximately logarithmic response to sound, the lecturer stressed the importance of knowing the relative values of the noises which combined to form the resulting noise which we hear, because it implied suppression of all sources of approximately equal level if any material improvement was to be made in the apparent loudness associated with that level. He had been unable to discover for the helicopter detailed information (of the type available for fixed-wing aircraft) regarding the various sources of noise and intensity levels; a survey of noise sources in current types would be a fruitful line of investigation. In the absence of detailed information he suggested headings under which the noise might be considered. They were as follows:—

(a) *Engine Exhaust Noise.*—This, more often than not, was relatively high. Silencing was usually associated with loss in power, and power was critical in the case of the helicopter. Operators would welcome the development of a silencing system efficient in noise-suppression without appreciable power-loss.

(b) *Engine Mechanism Noise.*—This was also relatively high and, because the source was likely to be housed in the fuselage, suppression might be more difficult than in fixed-wing transports. It was a problem of suspension and soundproofing, and one which was in the hands of the designer. Avoidance of associated clatter and rattle would call for maintenance by the operator.

(c) *Transmission Noise.*—There was no equivalent of the transmission noise in the fixed-wing aircraft, so its relative importance was not known, but transmission systems under power could cause a considerable amount of high-frequency noise and, further, it had been noticed that different transmissions of the same type could have appreciably different noise levels, depending upon their condition of assembly and wear. These points were mentioned as being of operational importance in relation to the chosen method of mounting the transmission in the airframe, and of soundproofing the units.

(d) *Rotor Noise.*—Main rotors rotated at low r.p.m. and the resulting low-frequency disturbances could sometimes be quite clearly heard, but the lecturer had not known them to be troublesome. Higher frequencies originating from torque-compensating tail rotors could also be heard, but were probably relatively unimportant. Generally speaking, noise from the rotors of helicopters now in service was likely to be relatively unimportant, but this might not be so later if higher tip-speeds were employed.

(e) *Local Resonance.*—Vibrationary disturbances covering a wide band of frequencies were present in the helicopter, and if care was not taken in the region of the cabin, local structures would resonate and equipment rattle. Such sources of annoyance could be overcome if the manufacturer paid attention to detail design and the operator to maintenance details.

(f) *Radio Noise.*—The pilot could suffer discomfort, nervous tension and fatigue from radio disturbances. The operator expected to be provided with efficient and accessible screening for the ignition system and other electrical gearing.

The author next referred to acceptable noise levels—starting with the cabin and cockpit—quoting several works on the subject, in particular *Human Factors in Air Transport Design*, by McFarland. Curves were used to illustrate findings of noise levels measured in six current types of air transport. They referred primarily to intensity levels above 600 cyc/sec. On the average, and at frequencies above 600 cyc/sec the comfort level was classed as "acceptable/comfortable," conversation being possible with raised voice. For future air transport, McFarland recommended a drop of some 20 db. However, journeys in helicopters would be of relatively short duration, and on the score that noise nuisance was (within limits) a function of time, it would seem reasonable to accept standards lower than McFarland recommended. Mr. McClements suggested a reasonable compromise (using a curve as illustration) having assumed that current air transports were not so quiet as the average passenger would like and that McFarland's recommendations appeared to be unnecessarily severe for the helicopter case.

Next, the lecturer considered external noise in relation to the helicopter. Mr. McClements said: "What acceptable external noise levels will be is difficult to say, because they will depend on a variety of factors, including the position of landing sites relative to dwellings, the approach-path relative to houses, traffic intensity, whether traffic is by day or night, and what the public is willing to stand. Further operational experience is required before firm recommendations can be made, but as an interim step I suggest that the resulting noise should not exceed that caused by traffic in a busy street. If this is taken as a yardstick, I suggest that the external noise should not exceed some 65-70 db at a distance of 100ft in any direction."

He went on to enumerate eight practical points relating to noise suppression within the helicopter, among them that ventilating systems should be so arranged that the opening of a ventilator did not give access to a sound source. Care should also be taken to provide for the removal and fitting of items—such as controls—without damage to the soundproofing properties of the assembly through which they passed.

The author next turned to the question of mechanical vibrations, elaborating on possible causes of discomfort and fatigue already briefly referred to in the second introductory paragraph. The lowest maintained fixed-wing disturbing frequency was usually about 1,200 cyc/min, but in the helicopter there were periodic disturbing frequencies of main rotor r.p.m. (approxi-

mately 200 cyc/min), and also multiples and fractions thereof.

In order to explore the practical implications of the low-frequency band of disturbances, an investigation had been undertaken by the B.E.A. Helicopter Unit on an S-51 machine,; in particular, explorations covered the frequencies and amplitudes in various directions and at various points in the structure under a variety of c.g. and flight conditions; they also covered the effect of change in such variables as main and tail rotor out of balance and out of track. The frequency band explored was up to 1,500 cyc/min, and it was discovered that the predominant disturbances were of frequencies:—

Approximately 200 cyc/min	....	1st main rotor order
„ 600 cyc/min	....	3rd „ „ „
„ 1,200 cyc/min	....	1st tail „ „

The records showed clearly that frequencies having values in the region of 15/18, 30/33 and 56/60 cyc/min were present.

Two important points which were brought to light by the investigations were, first, that a main rotor blade out-of-track was the most critical variable (one blade three inches out of track was sufficient to more than double the first- and third-order main rotor amplitudes). Secondly, when the S-51 was in its standard form in respect of balance and tracking, and flying at a speed of 67 m.p.h., the level of disturbance in the nose associated with the third order was just within the limit of comfort defined by Constant (*Aircraft Vibration*). At 90 m.p.h. the level was double Constant's threshold value. The level in the cabin at the cruising condition was approximately on Constant's threshold. The lecturer went on to recommend the provision to the operator of an improved means of main rotor blade tracking, and added that the findings showed that there was no doubt that low-frequency disturbances were present and had to be catered for.

The author then discussed flexible mountings and said that there was a need for development of a special type of flexible mounting for the isolation of low-frequency disturbances from equipment.

On the subject of acceptable vibration levels, Mr. McClements referred to the work of a variety of investigators, in particular a report by Goldman, of the Naval Medical Research Institute, Maryland (*A Review of Subjective Responses to Vibratory Motion of the Human Body in the Frequency Range* 1 *to* 70 *cyc/sec*). There was still a good deal of speculation about acceptable threshold values for the helicopter.

In conclusion, the author stressed the need for more factual data on acceptable noise and vibration levels; he believed that a good way of defining those levels was to allow the public to make the decisions. B.E.A. now carried helicopter passengers and could play a part by obtaining passenger and general-public reaction to noise. Already there had been indications that valuable information could be obtained in this way. During the B.E.A. passenger service last summer there were passenger complaints about the vibration level when the machine was known to be rough in respect of the rotor third-order level of disturbance, but no complaints when the machine was known to be normal. This was an example of passengers detecting the mechanical vibration sensation threshold—which, incidentally, tended to agree with Constant's threshold.

SOURCES of VIBRATION

MR. J. SHAPIRO (Cierva Autogiro Co., Ltd.), in making his "Survey of the Practical Approach to Characteristic Vibration Sources in Helicopters," dealt first with rotor unbalance. Rotor unbalance, he stated, was a once-per-rev impulse, and was thus normally a case for separation of impulse and response. The unbalance was a rotating force, the origin of which could be mass unbalance of the blades or geometric asymmetry in their distribution; the latter could be caused by (a) unequal pitch; (b) errors in geometry of articulation; and (c) unequal damper settings. Response depended on rotor mountings. Rotor r.p.m. had to be removed from the natural frequency of the hub on its mountings, and both sub-critical and super-critical mountings were practicable.

In considering natural frequency, it had to be borne in mind that a hub with rotating blades was a system with several degrees of freedom. If to a system with one degree of freedom a second degree was added, the effect was that of introducing a second natural frequency, and the lower of the two was less than the lowest individual natural frequency. The sum total of the effect of rotating articulated blades was that of a further degree of freedom, and the natural frequency of the system was lower than with equivalent masses representing the blade. Natural frequency could be computed if the dynamic and elastic characteristics of hub mountings were known. The natural frequency of the combined system was about 80 per cent of the stationary system.

Of vibration due to asymmetry in forward flight, the lecturer stated that, in the maze of inter-relations required for a full description, a useful approximation could be employed with some profit. In this, the blade was replaced by its centrifugal force, imagined to be acting along the blade axis. The mental picture thus obtained gave a few useful rules: (a) first harmonic of flapping produced no fluctuating forces and moments in a three-blade rotor; (b) second harmonic of flapping produced no fluctuating force other than a third harmonic fluctuating moment with flapping hinge offset in a three-blade rotor; (c) third harmonic of flapping produced third harmonic force and no movement in a three-blade rotor. The effect of forward flight asymmetry was therefore almost invariably a third harmonic. In this connection, the approximate rules which applied to flapping motion should be remembered, *viz.*, the first harmonic was proportional to tip-speed ratio and, therefore, speed. The second harmonic of flapping was proportional to the square of the tip-speed ratio, and the third harmonic was proportional to its fourth power. The higher order of vibrations therefore mounted quickly with forward speed, and to reduce impulses arising from forward speed it was advisable to have a low order of flapping hinge offset and a fast rotor with high inertia.

Hinge motion was due to flapping forces of the same frequency, and these forces resulted in a bending moment which induced elastic oscillation. It was usually the third harmonic which caused an unacceptably high order of elastic oscillation, because in most blades it was the nearest order to a natural frequency of the rotating blade. In blades of more or less current design it was sufficient to investigate the first three elastic modes, but in unconventional blades any modes giving frequencies up to the fifth or sixth order should be examined.

Blade motions about the drag hinge were of vital concern in several vibration systems. The lecturer stated that he was here dealing with forced oscillations due to impulses arising directly and indirectly from airflow asymmetry in forward flight. Direct effects were drag variations which caused movement about the hinge, and indirect effects were Coriolis forces which arose when flapping took place in the presence of coning (fundamentally due to the radial component of flapping motion). First-order flapping produced, among others, a second-order Coriolis acceleration and, hence, motions. In motion about the drag hinge, it was also useful to employ a substitute picture of the blade replaced by centrifugal force acting along the blade axis. Combinations of three blades gave the following results: no fluctuating forces or moments arose from first-harmonic motions. Third-harmonic motion would produce no forces other than a third-harmonic moment which became a torque oscillation. Second-harmonic motion produced no moment but a fourth-harmonic motion on the hub.

Many claims had been advanced for a rotor with rigidly mounted blades and a floating hub. A near relative was the two-bladed "semi-rigid" rotor which had no higher-order flapping, no free coning, and no drag freedom. It was blessed with mechanical simplicity, but afflicted with the peculiar vices of two-bladed rotors. One of these was a second-harmonic vibration due to drag fluctuations, particularly at given forward speeds. On the whole, this form of rotor had probably the most difficult set of residual-force vibrations; yet among the machines in which this system was applied there were some with an excellent reputation for smoothness. This had been achieved by adjusting the suspension of the rotor both to take care of the residual impulse and to isolate the rotor from the machine. In fact, the success of this procedure had led to a general rule that rigid blades required flexible rotor-mountings, whilst rigid mountings could be used only with articulated and/or very flexible blades.

Dealing with forced vibration due to abnormal aerodynamic states, Mr. Shapiro observed that tip-stalling due to high incidences at the tip of the rotating blade could give rise to a critical increase in impulse magnitude equal in frequency to r.p.m. multiplied by the number of blades. In a machine with an otherwise acceptable general vibration-level, excessive vibration had been experienced when the analytically determined aerodynamic incidence at the tip of the retreating blade reached an angle 4 deg above the stalling angle of the profile. It was visualized that, in view of the non-stationary nature of the stall, its effect was delayed. By means of blade twist, the use of cambered profiles, and high tip speed, tip-stalling could be made to occur at higher forward speed. Steep descent in conditions in which the rotor continuously worked in disturbed air (sometimes known as the "vortex-ring state") gave rise to oscillatory impulses of higher magnitude. There was some evidence to suggest that a once-per-rev impulse was possible, but this matter was largely unexplored.

In connection with forced vibrations due to engine torque impulses, i.e., torsional vibrations, there appeared to be no

reason why the operating range of r.p.m. could not be kept totally clear of resonant frequencies except for some very high engine orders, for which, in any case, inherent damping in the system appeared invariably to be adequate. Transient impulses could prove troublesome, and these were encountered in starting-clutch engagement, collective-pitch manipulation, engine cuts, and such faulty conditions as misfires, ignition faults and the like. The result of transient impulses was to set up free vibrations at all the natural frequencies of the system. In practice, it was mainly the lowest frequencies, unless the associated shape of the vibration had a node where the transient force was applied. The application of a sudden force could produce a transient stress up to twice that corresponding to the same force applied gradually, and this fact had to be borne in mind during transmission design. Vibrations set up by large transient torques were the main danger to the transmission, and determined its design and strength approval, but unless such impulses were recurring, their duration was too short to be of importance to comfort.

The conventional way of dealing with vibration induced by engine unbalance was through flexible mountings. Engines were usually suspended on rubber fittings for super-critical isolation from first and second orders. Elastic suspension of the whole power system, transmission system and rotor system was usually designed mainly with rotor frequencies in view, but isolation of the engine itself was more common in helicopters, although it required a universally-jointed transmission shaft.

Blades had been made of sufficiently uniform and durable shape to make tabs and tab adjustment superfluous. Alternatively, blades could be adjusted to a master blade by means of a simple dynamic rig. The lecturer gave it as his opinion that tab adjustment as a field method would not be acceptable in operation, and to deal with vibrations in control systems one of the above solutions would be adopted, although it was, perhaps, too early as yet to prophesy which would be chosen.

Of the self-excited vibrations, the so-called ground oscillations were by far the most general and important. They had been observed and recognized as a danger to rotary-wing aircraft on the ground ever since Autogiro days, and, indeed, probably constituted the most important cause of accidents. These ground oscillations—earlier known as "ground resonance," a thoroughly misleading designation—had always been associated with drag-articulated blades. The oscillations involved many degrees of freedom and a large number of factors, but the most fruitful advance in understanding and mastering the danger of ground oscillations was made when it was discovered that their main features could be derived from study of a simple mechanical model, namely a "hub" of a certain mass mounted with lateral elastic constraint in both directions. Articulated to the hub through vertical pins were three thin, heavy rods, and the hub was driven at constant angular velocity.

Such a mechanical model had five degrees of freedom in all, but when the geometrically obvious displacements were grouped into dynamic significance, it was of small importance that one of them—the displacement of all three blades by equal amounts about the drag pin—was isolated from the rest and was relevant only in relation to the torsional oscillations of the driveshaft. The remaining four degrees of freedom rendered four natural frequencies which depended on the rotational scheme. The main task facing the designer was to avoid an unstable gap falling even in part within the operating r.p.m. range. Furthermore, it was not permissible to operate at a condition where the natural frequency of the mechanical system coincided with the rotational frequency, since there were always once-per-rev impulses. To fulfil these two conditions, the analysis derived fom the mechanical model was entirely adequate. To obtain the dynamic parameters, analysis could be used in simple cases, but ground-resonance tests were usually essential. For such tests, the machine was excited at the hub by some form of exciter and the responses measured. In ground-resonance tests, the blades were replaced by concentrated weights.

On the score of unstable blade-motion, the lecturer observed that this was largely a matter of unstable motion of articulated blades about their flapping hinges. Such instability had been observed and/or analytically predicted in unusual designs of articulation under normal conditions, or in normal designs under abnormal conditions. Nevertheless, it could be stated that a high order of torsional stiffness was inevitably desirable. Perhaps a good practical rule was that the natural frequency of the blade in torsion should not be less than the third rotor order. From the practical point of view, it was important that resonance tests should be carried out on the ground to simulate flight conditions in which the collective control system was excited and the response measured whilst the rotor was rotating. By this means, the approach of flutter could be reliably judged.

MEASUREMENT of VIBRATION

IN the absence, through family ill-health, of Mr. M. O. W. Wolfe, D.I.C. (R.A.E.), the contribution on vibration measurement was made by his colleague, Dr. G. E. Bennett.

The normal modes of vibration in an aircraft were determined experimentally by applying a mechanical sinusoidal exciting force to a suitable part of the aircraft and measuring the magnitude and phase relationship of the resultant motions of various parts of the structure. There were several ways of generating and applying a sinusoidal exciting force, that which was most commonly used being the mechanical inertia exciter method.

The response of the structure was measured by attaching vibration pick-ups at various points and comparing the motions at these points with that of a datum point on the structure. Single- and double-beam oscilloscopes were used for this purpose, amplitude being measured on the single-beam and phase on the double-beam cathode-ray tubes. The electronic pick-ups were normally of the moving-coil type, of which there were two basic forms, one, a non-seismic type for very low frequencies, and the other a seismic type for medium and higher frequencies.

The type of instrumentation used for flight vibration investigations depended on the purpose of the tests, and the sort of information required. In general, it was necessary to use a method—such as photography—which would permit subsequent analysis on the ground. For a quick preliminary survey, a self-contained instrument such as the R.A.E. vibrograph could be used, but for more detailed investigations involving a study of modes, as well as amplitudes and frequencies, multi-channel flight recorders and electronic pick-ups were required. Various types of pick-up were available; for most purposes, the moving-coil seismic type was most suitable, but for very low frequencies an accelerometer-type pick-up could be used with double-electrical integration to give amplitude measurements. For purposes such as the investigation of rotor vibration and torsional vibration in the engine/rotor system, wire-resistance strain-gauges were the most suitable, although torsional vibrations of the engine could also be measured by a torsional seismic electro-magnetic pick-up similar in principle to the linear type used for resonance testing.

AIRWORTHINESS

THE final paper presented at the symposium was given by Mr. R. H. Warde (Air Registration Board), who started by saying that, before attempting to describe how design requirements contributed toward the airworthiness of helicopters in the presence of vibrations he should mention the need for the Requirements, and make brief reference to current British Civil Airworthiness Requirements.

The Air Registration Board had but one function to perform, and this was to satisfy itself as far as possible that a particular aircraft was airworthy so that, when required, a recommendation could be made to the Minister of Civil Aviation that a C. of A. should be issued. It was important to mention this, as the duties undertaken by the A.R.B. were often misunderstood.

Assuming that a prototype helicopter had been designed and built to comply with Section G of the British Civil Airworthiness Requirements, a series of tests in accordance with the principles laid down in Chapter G 7-1 should be carried out in a closely controlled sequence. This testing covered only the minimum that it was considered was required to determine the airworthiness of the aircraft. It had to be emphasized that all concerned with both the testing and maintenance of helicopters should face the problem in the manner adopted by engine and airscrew manufacturers, by contrast to that adopted by the constructors of fixed-wing aircraft. The standard of detail design and inspection of all moving parts had to be of the highest possible order.

The sequence of tests should adhere, wherever possible, to the following pattern:—

(1) Design development-rig tests of components including preliminary fatigue tests of parts where the working stresses could be estimated by calculations.

(2) Spin-test of rotor system. This test should, wherever possible, include the rotor hub complete with the blades and pitch-changing mechanism, and should include an overspeed test with observation made to check for flutter.

(3) Preliminary ground vibration stress measurements on the

EXPERIENCED TRAVELLERS FLY BRITISH

BRITISH OVERSEAS AIRWAYS CORPORATION AND BRITISH EUROPEAN AIRWAYS

offer services to and from nearly 70 countries

MAN WITHOUT GUN STAGES HOLD-UP!

Users of the incomparable A.I.D. Model 2 Spray Guns never suffer loss this way. As long as spare guns are included in the first order, the A.I.D. Instant Reserve Replacement Service means perpetual freedom from all hold-ups in the Paint Shop. New or reconditioned guns are rapidly exchanged for all worn or damaged guns. INSTANT SERVICE, every hour of every day, ensuring 100% manhour efficiency ... that is what A.I.D. offer every user, everywhere. Home and overseas buyers are invited to write now for full particulars.

TIME IS MONEY — TAKE ADVANTAGE OF THE

A·I·D
COMPRESSED AIR EQUIPMENT

★*INSTANT* RESERVE REPLACEMENT SERVICE

The unique A.I.D. Service Organization covers the Gun and everything behind the Gun, including Stationary and Mobile Air Compressor Units; Water Wash and Dry Back Spray Booths and Infra-red Drying; Hot Spray and Lacquer Plants; Flock Gun Equipment; Material and Air Hose, etc.

Sole Manufacturers: AIR INDUSTRIAL DEVELOPMENTS LIMITED, Aldspray Works, Shenstone, Nr. Lichfield, Staffs, England. Phone: Shenstone 341/5. Grams: Aldspray, Shenstone. LONDON, 28 South Molton Street, W.1. Phone: Mayfair 6318. Grams: Aldspray, Wesdo. MANCHESTER, 141 Grove Lane, Cheadle Hulme, Cheshire. GLASGOW, 396-406 Hillington Road, North Cardonald Estate, Glasgow. Phone: Half 3258. BRISTOL, Little Court, Golden Valley, Bitton, Nr. Bristol.

CANADA, 350 Hillcrest Avenue, Willowdale, Toronto. Phone: Willowdale 3567

VIBRATIONS in HELICOPTERS . . .

complete transmission system in an actual helicopter airframe with particular reference to torsional vibration and whirling of transmission shafting and the effect of starting and stopping rotation. This test should include a preliminary investigation of the blade vibratory stresses.

(4) Not less than 50 hours' running test of the complete rotorcraft to a schedule to be agreed with the Board. This test should be made on the ground, and include the case of the complete helicopter tethered close to the ground but not touching it. At the conclusion of the test a complete strip examination must be made of all parts, and only when all concerned were satisfied with the condition of the parts would the tests be continued in accordance with the following paragraphs. This test could, if required or deemed advisable at the time, be used as part of the official type-test of the engine and/or transmission and rotor system.

(5) Preliminary flight tests of the helicopter for not more than five hours within a limited envelope of manœuvres. During this flying vibratory strain-gauging would be undertaken. If the ground tests referred to previously had shown doubtful results by virtue of the condition of the parts or preliminary strain-gauge tests, then new parts were to be used for this preliminary flying.

(6) The following additional testing to be undertaken in a sequence to be determined according to the results obtained from the tests outlined in the preceding paragraphs:—

(a) Extension of five hours' flying to obtain further data.
(b) Further laboratory fatigue tests of components subject to vibratory stresses in the light of the results so far obtained from the flight strain-gauge tests.
(c) Comprehensive flight strain-gauge measurements under all manœuvres.
(d) Should the results of previous tests show the necessity, by reason of the results or the necessity for modification, the continuance of the 50 hours' ground running for an agreed period and further laboratory fatigue test of components.
(e) 50 hours' flight test to a schedule to be agreed. At the conclusion of this test a complete strip examination would be made of all parts and only when all concerned were satisfied, the tests continued. This test could, if required, be used as part of the official type test of the engine and/or transmission and rotor systems.
(f) Not less than 100 hours' endurance flying during which handling suitability and performance tests might be undertaken. A complete strip examination of all parts would follow.

As mentioned previously, it seemed inevitable that the majority of components subject to vibratory stresses would have a life placed on them (after which they became scrap) to ensure continued airworthiness of the helicopter. The test here described should ensure a reasonable measure of reliability and establish a background on which to determine the life of certain parts. It was only by a rigid adherence to this principle, coupled with a very high standard of inspection at frequent intervals, that continued airworthiness could be ensured. This subject presented some problems of considerable magnitude and could not be dealt with in any detail at this time. It was sufficient to say, however, that the Air Registration Board was now considering the drafting of some recommended practices with a view to establishing some recognized procedure for the future.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Brief Encounter

WHILE recently on holiday in Bavaria I came across an ex-Lufthansa pilot, Herr Meirer, who used to be on the Cologne-Hendon run and subsequently joined the Luftwaffe.

His outstanding war experience was a duel with a Spitfire over the Channel in 1940. Both aircraft were badly shot up but apparently neither pilot was hit. Eventually they both ran out of ammunition at the same time. The British pilot, realizing this, flew alongside and gave a friendly wave.

If his late British opponent is still alive, Herr Meirer would very much like to contact him and, as he speaks very little English, has asked me to help him. I have been advised by civil aviation friends here that your valuable publication is the best method. Should the British pilot still be around, therefore, would he please contact: Herr Karl Dietrich Meirer, Park Café, Unterwössen (Oberbayern), Germany.

Details were as follows: Aircraft: Me109 F-2 day fighter; markings: Yellow 7. Time: September, 1940, midday (exact date unfortunately forgotten). Place: Mid-Channel, area Dover-Calais. Circumstances: Blenheims were being attacked by a Squadron of Messerschmitts which was intercepted by a squadron of Spitfires. The duel in question commenced above cumulus clouds. After both aircraft had been badly shot up ammunition was exhausted and petrol very low. There were German losses in this encounter. The Messerschmitts were stationed at Peublique, near Cap Grisnez, and the encounter took place ten minutes' flying-time away.

G. G. MARTIN,
Publicity Manager,
Eagle-Lion-Film.

Hamburg, Germany.

[If the British pilot mentioned should see this letter, we also would be interested to hear from him.—ED.]

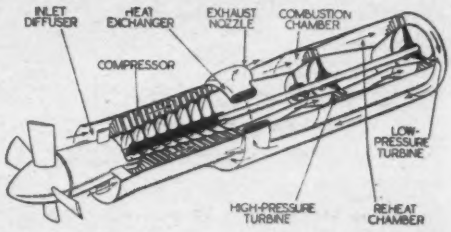
"Reheat" instead of "Afterburning"

RISKING a charge of tautology, may I again draw attention to the official practice in Britain of using the term "reheating" to describe "afterburning" on a turbojet? More than a year ago I pointed out that, as "reheat" was long established as a second combustion chamber between successive turbine stages of a shaft-power turbine unit, it was undesirable and confusing to apply the same term to the process of burning additional fuel, after the turbine, in a jet propulsion unit. It was to be logically presumed that, in the pursuit of greater power output and improved efficiency, aircraft turbines would become more complicated, that more than a single turbine stage would become necessary and that reheat chambers would be used.

Recently, new projects in the U.S.A. have confirmed this trend. The N.A.C.A. has published a turboprop design [illustrated here.—ED.] having a reheat chamber between the first and second turbine stages. Westinghouse has shown a scheme for a turboprop with two intercooled stages of compressors driven by independent high- and low-pressure turbines, also having a reheat chamber. This, I think, underlines my point.

J. TALBOT.

London, W.1.



This "reheat turboprop" was the subject of an N.A.C.A. design-study.

Navigation Aids

MR. BAILEY-WATSON, writing in the January 11th issue of *Flight*, is obviously in favour of Decca, and its use as the standard European aid to navigation. However, its use in *war-time* would, at the best, be severely restricted, and probably be stopped altogether for reasons which must be obvious. What then?

Another point which this article has not made clear to me (and I suppose to other readers), concerns the altitude to which Decca is fully efficient. Can it be made effective to altitudes of 40,000ft or so? The article refers to its use at low altitudes of, say, 6,000ft, but this seems a most unrealistic height by which to judge its capabilities, both now and in the future.

R. M. C.

Holywood, Co. Down.

[Both the war-time aspect and the altitude effect were, in fact, referred to by the author. For the first, the consideration is of civil aids. In war, an entirely different situation exists, but even so Decca is less vulnerable to enemy interference than are most other aids considered for civil use. As to altitude limitation, it was stated that this did not exist. Within the area of Decca-chain coverage, readings can be obtained as effectively at 100,000ft as at sea level.—ED.]

A.T.C. BOXING CHAMPIONSHIPS

The Duke of Gloucester Sees Exciting Contests at the Albert Hall

"Flight" photograph.

Cdt. R. Blackburn, 1701 (Johnstone) Squadron, gets one in during his "best performance of the evening" bout with Cdt. E. O'Brien.

The expressions of H.R.H. the Duke of Gloucester and the C.A.S., Marshal of the R.A.F. Sir John Slessor, appear to denote boxing worthy of keen interest.

NO comparable annual occasion attracts so many senior R.A.F. officers as do the A.T.C. Boxing Championship finals held at Albert Hall, and last Monday, January 22nd, H.R.H. the Duke of Gloucester also honoured the A.T.C. with his presence. There were some remarkably good bouts for him to see. For the first time A.B.A. weight classifications were used, and, therefore, some of the cups presented annually were transferred to new categories for competition. Thus, the *Flight* Cup, won in 1950 by Cdt. R. Higgins, midget-weight (7 st) was this year contested by Cdt. E. Guntrip and Cdt. Cpl. J. Smith in Class C (11 st 11 lb). Smith was a decisive winner by a virtual knock-out, the referee stopping the fight in the second round.

The results of the sixteen contests between Northern and Southern champions are tabulated. Northern champions were in the Red corner, Southern champions in the Blue. In each case the opponents had fought through Unit, Wing, Group, Inter-Group and Northern and Southern area finals to get to the Albert Hall.

Several noteworthy bouts occurred, and the very first produced one of the best fights of the evening. Cdt. T. Christie (8 st) beat Cdt. M. Inwood on points, but Inwood was nevertheless judged the best loser of the evening and thus received the Roy Limbert Cup from the Chief of the Air Staff for his performance. Despite his relatively light weight, Cdt. H. Monahan (defeated by Higgins in the final for the *Flight* Cup last year) this time knocked out his opponent in the first round. He fought the second bout of the programme in Class B (8 st 7 lb).

Everyone's sympathy (including that of his opponent, Cdt. B. Davis, it seemed) went out to Cdt. D. Mayer, who was unlucky enough to be disqualified as the result of a rising blow judged to have landed low. A hard body-puncher, he had been an almost certain points winner. In the first Class C bout at 8 st, Cdt. S. Orr scored a very good points win over Cdt. J. Hemmings, and later Cdt. R. Jackson (10 st), the only coloured competitor this year, beat Cdt. P. Wright on points.

The evening ended with three spectacular fights at weights of 11 st 2 lb, 11 st 11 lb and 12 st 10 lb. Cdt. J. Brown knocked out Cdt. Cpl. J. Webster in about 15 seconds as the result of a tremendous opening onslaught. Cdt. Cpl. J. Smith, as already recorded, defeated Cdt. E. Guntrip, who had already been saved once by the first-round bell, and finally Cdt. G. W. Fox so hammered Cdt. J. Terry that the referee stopped the fight less than half-way through the first round. The A. J. Elvin Cup for the best performance in the Championships was again won by Cdt. Cpl. R. Blackburn (10 st 8 lb) of 1701 (Johnstone) Squadron.

The Silver Wings trophies presented to the winning Southern and Northern Squadrons went to 1582 (Ardale) Squadron (Southern), and 1701 (Johnstone) Squadron (Northern). The Duke of Gloucester presented the Harewood Trophy to 61 Group, who were also successful last year. The final position of the Groups was as follows: No. 61 Group, 22 points; No. 63, 20; No. 66, 16; Wales, 14; No. 64, 11; No. 67, 9; No. 65, 2; No. 62, nil. For the finals the winner receives three points for his Group and the loser one. In view of its size, the Welsh Group did particularly well to gain 14 points.

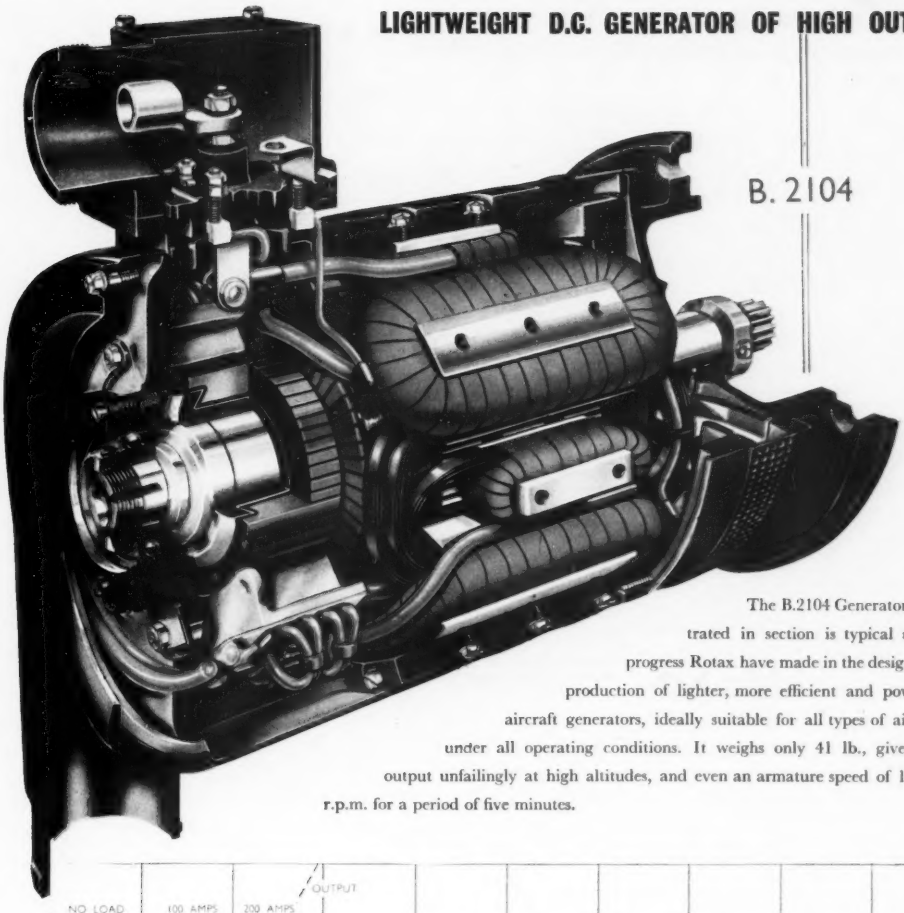
As usual on these occasions, musical selections were provided by the Central Band of the R.A.F., conducted by F/L. F. A. Gale, Director of Music.

During the afternoon of January 22nd seven bouts in Class A (age group 15-16 years) were decided at the Metropolitan Police Gymnasium. Finalists in this class also received points towards the Inter-Squadron competition for the Harewood Trophy.

Bout	Name of Winner	Squadron*	Name of Opponent	Squadron	Trophy
Class B (Age 16- 17)					
st lb					
8 0	Cdt. T. Christie	1703 (Kilsyth) N.	Cdt. M. Inwood	1223 (Caerphilly)	*The Aeroplane* Cup
8 7	Cdt. A. Monahan	281 (Southport) N.	Cdt. P. Ellery	212 (Islwyn)	Sir Simon Marks Cup
9 0	Cdt. Sgt. Ramsey	1034 (Surbiton) S.	Cdt. Cpl. J. Grattan	498 (Wishaw)	*Aeronautics* Cup
9 7	Cdt. B. Davis	2156 (Rowley Regis)N.	Cdt. D. Mayer	2048 (Dagenham)	Eland Cup
10 0	Cdt. D. Sainsbury	1148 (Penarth) S.	Cdt. L. Ward	209 (Nottingham)	Sir Adrian Chamier Cup
10 7	Cdt. F. J. Patterson	1919 (Fort William, Belfast) N.	Cdt. C. Wynne	1582 (Ardale School)	Bailey Cup
11 0	Cdt. G. J. Anslow	196 (Walsall) N.	Cdt. J. Turner	1015 (Horsham)	Londonderry Cup
Class C (Age 17-18)					
8 0	Cdt. S. Orr	817 (Lisburn) N.	Cdt. J. Hemmings	328 (Kingston)	Lawley Cup
8 7	Cdt. Bolger	2048 (Dagenham) S.	Cdt. F. Stanley	1262 (Blackburn)	Glendyne Cup
9 0	Cdt. D. Thomas	1812 (Dowlais) S.	Cdt. W. Waddell	1000 (Bedlington)	Duncan Smith Cup
9 7	Cdt. P. Jones	1223 (Caerphilly) S.	Cdt. T. Mullen	250 (Halifax)	*Air Reserve Gazette* Cup
10 0	Cdt. R. Jackson	178 (2nd Blackpool) N.	Cdt. P. Wright	1582 (Ardale School)	Hilary Cup
10 8	Cdt. R. Blackburn	1701 (Johnstone) N.	Cdt. E. O'Brien	1061 (Southwark)	Arthur Mack Cup
11 2	Cdt. J. Brown	2180 (Galashiels) N.	Cdt. Cpl. J. Webster	39F (Barnes)	Sir Harry Price Cup
11 11	Cdt. Cpl. J. Smith	39F (Barnes) S.	Cdt. E. Guntrip	178 (Blackpool)	*Flight* Cup
12 10	Cdt. G. W. Fox	103 (Doncaster) N.	Cdt. J. Terry	1582 (Ardale School)	Robert Strauss Cup

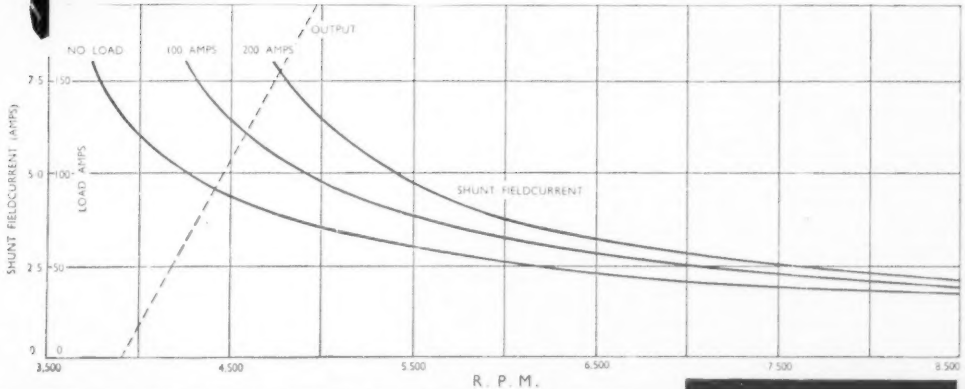
* Bouts were between Southern and Northern champions. "S" or "N" indicates the winner's area. The final for the Sir Bertram Jones cup was cancelled, the Southern champion being over weight (7 st 7 lb).

LIGHTWEIGHT D.C. GENERATOR OF HIGH OUTPUT



B. 2104

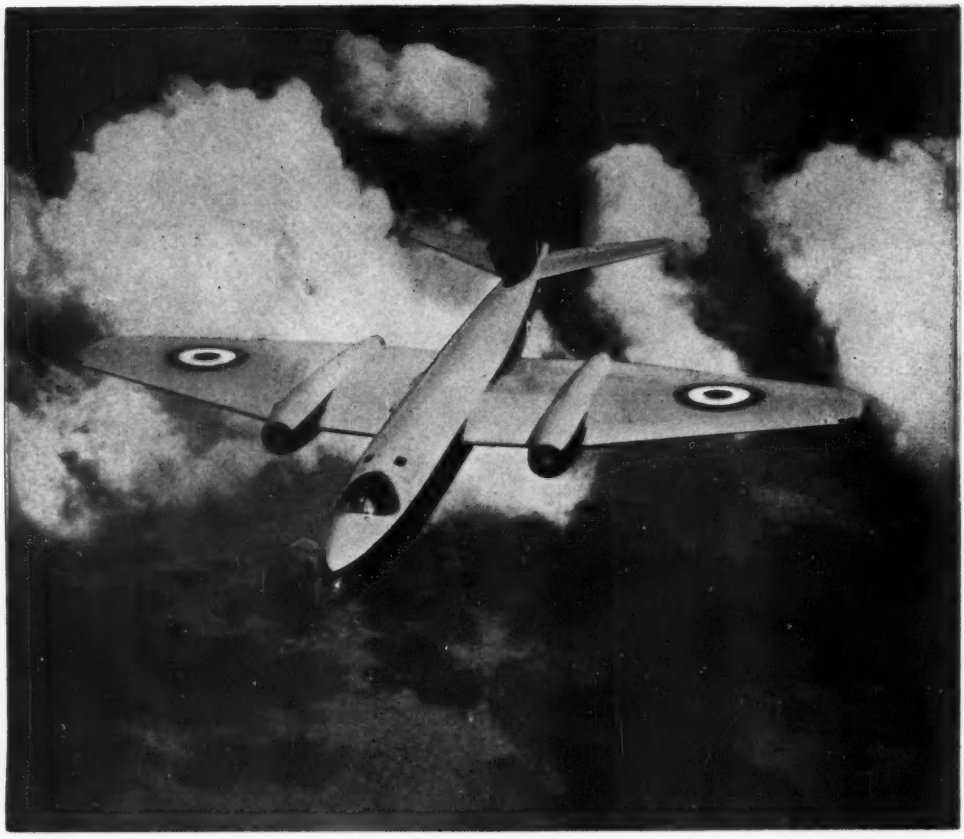
The B.2104 Generator illustrated in section is typical of the progress Rotax have made in the design and production of lighter, more efficient and powerful aircraft generators, ideally suitable for all types of aircraft under all operating conditions. It weighs only 41 lb., gives full output unfailingly at high altitudes, and even an armature speed of 10,000 r.p.m. for a period of five minutes.



THE MOST ADVANCED ELECTRICAL SYSTEMS AND EQUIPMENT FOR AIRCRAFT

ROTAX LIMITED . WILLESDEN JUNCTION . LONDON N.W.10 . ENGLAND
ROTAX AUSTRALIA PTY. LIMITED . 81 BOUVERIE STREET . MELBOURNE N.3 . VICTORIA
ROTAX CANADA LIMITED MONTREAL AIRPORT . DORVAL P.Q.

ROTAX



CANBERRA Mk.2

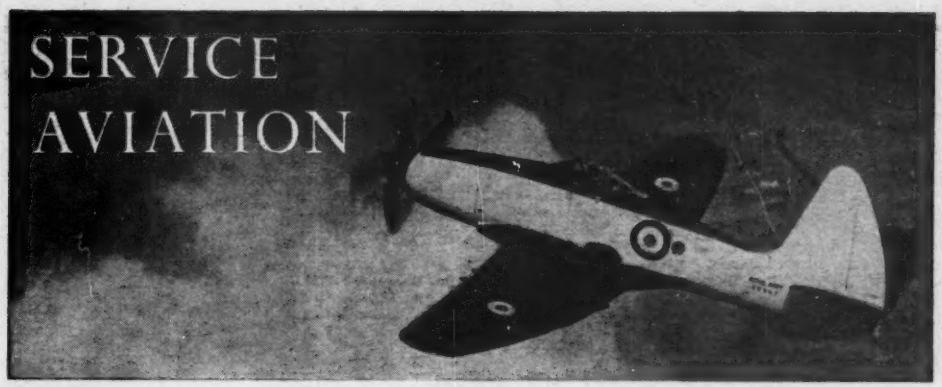
designed and built by

The
ENGLISH ELECTRIC
Company Limited

Designers and Constructors of Aircraft since 1911

REGISTERED OFFICE: QUEENS HOUSE, KINGSWAY, LONDON, W.C.2
WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL

SERVICE AVIATION



PYTHON-POWERED: A new study of the Westland Wyvern 2 strike-fighter (Armstrong Siddeley Python), now in production for Naval Aviation.

Royal Air Force and Naval Aviation News and Announcements

Recalling R.A.F. Reserves

FROM the outline given by the Prime Minister, Mr. Attlee, in the House of Commons last Monday, it is possible to summarize the effects on the R.A.F. of the Government's plan to recall reservists for summer training. Next week the plans are to be given in greater detail.

The R.A.F. will recall for 15 days' training about 10,000 officers and men from its Class G (equivalent of Army Class Z) Reserve. The greater majority will be those called up before the end of 1948. They will be given 15 days' training with the fighter-control and raid-reporting organizations. Normal rates of pay and a bounty of £4 will be paid to all these reservists.

Some men already serving in active reserve units will, it seems, be recalled for longer periods. "Fighter squadrons of the R. Aux. A.F.," said the Prime Minister, "are essential for defence; officers and men numbering about 2,300 will be called up for three months' continuous training." He announced also that the R.A.F. would give three months' refresher training to "1,000 aircrew reserves"—mostly members of the R.A.F.V.R. and Royal Air Force Reserve of Officers. Finally, about 200 reservist flying instructors would be required for periods of up to 18 months.

Those to be called up would, it was promised, be given maximum notice of the date on which to join their unit. Cases of hardship would be given a sympathetic hearing.

On the subject of equipment, Mr. Attlee mentioned that "production of the Canberra will be increased, and first orders are being placed for the four-engined jet bomber."

Changes in Air Council

WITH effect from to-day, February 1st, equipment and engineering staffs at the Air Ministry are brought under the control of one member of the Air Council. Under this arrangement, Air Chief Marshal Sir William Dickson, K.B.E., C.B., D.S.O., A.F.C. (who retains his present title of Air Member for Supply and Organization), takes charge of Technical Services, comprising repair, maintenance and technical training, in addition to his existing responsibility for organization, works and equipment. He will be assisted by a Controller of Engineering and Equipment. This post will normally be filled by an officer of the Technical Branch and the first holder is Air Marshal C. W. Weedon, C.B., C.B.E., M.A., A.F.R.Ae.S., who was, until recently, Director-General of Technical Services (II) at the Air Ministry.

Air Marshal Sir Victor Goddard, K.C.B., C.B.E., the Air Member for Technical Services, is retiring from the R.A.F. He had held this post since August, 1948, and was formerly Deputy Head of the Air Force Staff, British Joint Services Mission, Washington, from April, 1946. Sir Victor, who is 53, entered the Navy as a midshipman in 1914 and transferred from the R.N.A.S. to the R.A.F. in 1918. During the last war he was, for a period, C.A.S. to the Royal New Zealand Air Force, later taking charge of administration of Air Command, South-East Asia.

Fairey 17s Ordered

IT was officially announced last Tuesday, January 30th, that a substantial order has been placed by the Ministry of Supply on behalf of the Admiralty for Fairey 17 anti-submarine aircraft, so far unnamed, powered with Armstrong Siddeley Double Mamba turboprops.

New R.N.V.R. Squadron

THE air strength of the R.N.V.R. will be increased to five squadrons by the formation of a new squadron for pilots and observers, at Culham. Pilots will be drawn mainly from Surrey, Sussex, Kent and Hampshire but observers, it is hoped, will be drawn from the whole of South-Eastern England. The new squadron—so far undesignated—will eventually be based at Ford, near Arundel. Having an establishment for observers, it will, presumably, be equipped with Fireflies.

Plans are in hand for giving additional flying training to former Naval pilots and observers under the age of 35. Pilots on the new "List II" will receive 40 hours' flying training annually on light aircraft: 20 hours at weekends or evenings and 20 hours during the annual 14-day training period. Most of the refresher training given under this scheme will be at R.A.F. reserve flying schools, but in some cases the 14 days' continuous training will be in one of H.M. Ships or at an air station.

Refresher training for observers will be given either on List I (during annual training with an R.N.V.R. squadron) or on List II at a suitable Naval school or air station or at sea. The target for observers will be 20 hours' flying annually—all to be carried out during the 14-day period of continuous training. Annual bounties paid to R.N.V.R. officers are £35 for these on List I, £7 for those on List II.

Services Rugby Football

ON February 10th, the Royal Air Force meets the Royal Navy in the first round of the Inter-Services Rugby Football Tournament at Twickenham. A rather discouraging display against Leicester last week, when the R.A.F. lost by 21 points to 3, will no doubt spur the team on to greater efforts—and, it is hoped, to practice giving and receiving passes. The Navy have not beaten the Air Force since 1935, but there were draws in 1937, 1947 and 1950.

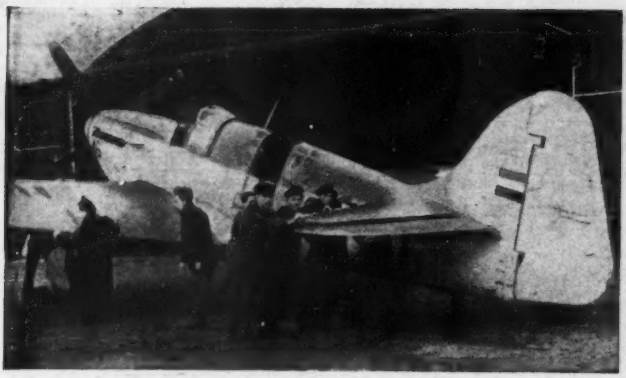
The Navy team have suffered two regrettable losses this season: Lt. J. L. Miller was killed in a car accident in October, and Lt. J. Grieve was recently lost in a flying accident.

B.U.A.S. Ball

FOUR hundred officers, cadets and guests of the Birmingham University Air Squadron attended the annual ball of the Squadron at Edgbaston last Friday. Two bands and a cabaret provided entertainment for six hours and squadron members stood-in for artistes prevented from attending by influenza. The same complaint caused the absence of the chief guest, A. Cdre. G. H. Vasse, the A.O.C. No. 63 Group. The guests were welcomed by the C.O., S/L. J. Aiken.

Naval N.S. Pilots

THE first four Naval National Servicemen to qualify as pilots during their two years' service were presented with their "wings" at a parade last Friday at



FOR WESTERN DEFENCE: The attachment of two Dutch Naval squadrons to the Royal Navy is the latest instance of Western Union collective training. Seen on arrival last week at Eglington, Northern Ireland, is a Firefly of No. 4 Squadron, which is commanded by Lt. Cdr. Ledekerken (right). The other Netherlands unit, No. 860 Squadron (Sea Furies), is now operating from St. Merryn, Cornwall.

SERVICE AVIATION . . .

R.A.F. Station Syerston. The badges were presented by Capt. Anthony Kimmins, O.B.E., R.N. (ret.), who also took the salute at a parade of R.A.F. and Naval personnel. One of the qualifying pilots was his own son, Midshipman Simon Kimmins; the others were Sub-Lt. (A) N. J. Cook and Midshipmen V. Leahy and P. J. Medcalf.

Having reached wings standard in Prentices and Harvards, the four will receive further training in deck-landing and specialized fighter or anti-submarine technique before their release.

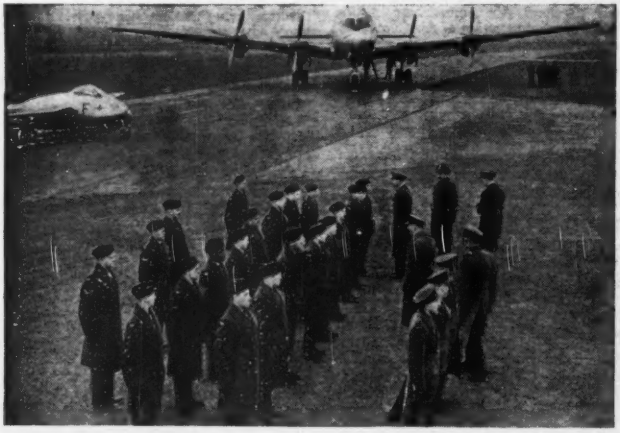
The Admiralty is prepared to award up to 160 commissions to National Service pilots and observers. Any youth due for call-up, and of a sufficient educational standard, may qualify for aircrew training with the Navy by passing the required selection board and medical examination three months before call-up. On release after two years' service, N.S. aircrew are required to join the R.N.V.R. air squadrons for a period of not less than five years.

A.S.T. to Train Navigators

IT is announced that Air Service Training, Ltd., is to undertake, at Hamble, the basic training of R.A.F. navigators. The first course for these officer cadets, drawn from National Servicemen, is to start on February 7th, and numbers of Anson navigation trainers are being delivered to Hamble.

The flying staff of pilots, navigation instructors and signallers will consist of A.S.T. personnel, as will the aircraft maintenance crews. A small number of R.A.F. officers, N.C.O.s and other ranks will be attached to the school for administrative duties and these, together with the pupils, will be accommodated at A.S.T. There will be up to 80 cadets under training.

Air Service Training, a member-company of the Hawker Siddeley Group, trained over 40,000 R.A.F. and Allied air force personnel in every type of flying, airfield control and aeronautical engineering during the war. Since 1946, when A.S.T. was re-opened to civilians, some hundreds of students from 40 different countries have been passed out on the various courses.



RED INDIANS ARRIVE: The scene at Odiham recently, when the advance guard of No. 421 (Red Indian) Squadron, R.C.A.F., arrived by North Star to begin a 12-month period of training with Fighter Command. The Squadron is being newly equipped with Vampire 5s.

Reunions

PORT Said and Alexandria Seaplane Base.—29th annual reunion at 1800 hr on April 7th at Stewarts Restaurant, Old Bond Street, London, W.1. Details from F. A. Gill, Pine Lodge, Woodham Lane, Woking, Surrey.

* * *

H.Q. 14th Army/3rd T.A.F. Dinner Club.—Annual dinner on March 2nd at the Connaught Rooms, Great Queen Street, Kingsway, London, W.C.2.

* * *

25 Group and Stations, officers R.A.F., W.A.A.F. and Allied.—Reunion at 1830 hr on March 16th at the Westminster Arms, Page Street, London, S.W. Postal orders for 7s to A. V-M. R. D. Davis, C.B., O.B.E., Shell-Mex House, Strand, London, W.C.2, (mark envelopes "25 Group").

* * *

No. 78 Squadron.—Third annual reunion at Stewarts Quadrant Restaurant, 74, Regent Street, London, W.1, at 1830 hr on April 14th. Details from F. Ivers, c/o Kepcold, Ltd., 23, Carnaby Street, London, W.1.

* * *

No. 28 Squadron.—Fifth annual reunion on Saturday, February 3rd, at the Barley Mow, Horseferry Road, Victoria, London, S.W.1. Tickets (15s) from C. E. Bland, 2, Seymour Terrace, Anerley, London, S.E.20.

* * *

R.F.C. and R.N.A.S.—Second reunion buffet-cocktail party at the Dorchester Hotel, Park Lane, London, W.1, on April 13th at 1830 hrs. Dress lounge suits or uniform. Applications (only from those who served in the R.F.C. or R.N.A.S. before the merger on April 1st, 1918) for tickets (30s) should be sent to Capt. E. Keith-Davies, c/o Messrs. Keith and Boyle (Ldn.), Ltd., 30, Harleyford Road, Vauxhall, London, S.E.11. Applicants are asked to state approximate date of joining and to mark envelopes "Reunion" in bottom left-hand corner.

Midland Bank

Services

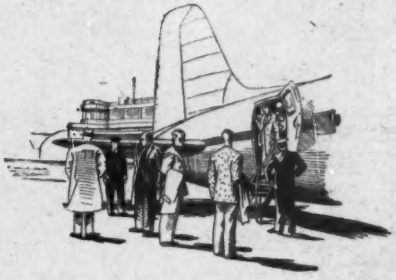
for those

who travel by air

As part of the policy of making banking services available wherever they are needed, the Midland Bank has established branches in the passengers' arrival halls of the principal airports. A complete banking service is provided at these offices, including facilities for foreign exchange and other special requirements of the traveller.

Midland Bank Airport Branches are at:

NORTHOLT FELTHAM
CROYDON MANCHESTER



HAWKER SIDDELEY GROUP LIMITED

T. O. M. SOPWITH ASKS FOR URGENCY IN REARMING BRITAIN, ALLIES

Needed Aircraft Cannot Be Built Overnight

DIRECTION OF LABOUR

The 15th annual general meeting of Hawker Siddeley Group, Ltd., was held on January 24 in London.

Mr. T. O. M. Sopwith, C.B.E. (the chairman), in the course of his speech said that although there had been a decline in export turnover their overseas business had, nevertheless remained at a substantial level and the financial results of the year 1949-50 were, he hoped shareholders would agree, satisfactory.

It was still the intention of the board, when permission could be obtained, to make their issued capital more realistic by the capitalisation of a portion of their reserves. The board were again recommending a final Ordinary dividend of 17½ per cent, making 32½ per cent for the year. In the opinion of the board there could be no doubt as to the propriety of modernising the capital structure. It was especially desirable in view of the international prestige of the organisation which had made, and was making, noteworthy contributions to the nation's export drive. They felt that the authorities should take a broader view in such an undertaking as theirs.

They were continuing the policy of building up very necessary reserves for replacement of fixed assets and for development. The development of new aircraft and power units involved continual replacement of plant and equipment. It was essential that ample resources should be available.

GENERAL SURVEY

The chairman continued: In these days we are living under the shadow of a world-wide catastrophe. The times are sadly reminiscent of Munich and the "phoney war." Call it what you will—police action, the troubles of an uneasy peace, or undeclared war—British, Commonwealth, and Allied troops are being killed in Malaya and Korea. At the United Nations in Lake Success our envoys and our intentions are being insulted and ridiculed in much the same manner as at Berchtesgaden of unhappy memory. If the situation deteriorates—and it may deteriorate rapidly—are we as a nation and a Commonwealth prepared? Have the R.A.F. and the Commonwealth air forces the defensive strength they require to preserve the security and freedom of our peoples? We believe the answer is no. We look across the ocean and see our great ally, the United States, girding its vast production machine to the preservation of peace. Without violating security details we know that similarly here in Western Europe, H.M. Government, and the Governments of our allies, have planned major increases in our fighting strength. Big programmes are under consideration. Initial orders have been placed.

But remembering the lessons of the last war we plead the case for urgency, for an expedition of plans and orders, because we know that aircraft in sufficient numbers cannot be built overnight. Whilst time is ticking away the defence and freedom of our country are in jeopardy. It is our considered belief that a national emergency exists. We believe the facts are there for all to see. As a group we have done everything that we humanly can do to put ourselves in readiness for the rearmament programme. In collaboration with the Government we have developed new and revolutionary types of aircraft and engines, many of which are still on the secret list. Many new and advanced types of military aircraft are in various stages of development and production throughout the group. Your group has maintained its leading position in the field of advanced scientific development of aircraft, including rockets and guided missiles.

In each branch of the group's widespread activities there has been continuous and satisfactory progress.

MANAGEMENT AND LABOUR

Within the period under review there were 38,000 employees in your group. I am happy to be able to report that we have again enjoyed excellent relations between management and labour. Without any doubt the strengthening of our labour force with the rapidly increasing requirements of the rearmament programme is going to be a matter of serious concern to your board. At the peak of our production in the last war we employed over 100,000 people—men and women. Where and when we are going to get even a similar-sized labour force of similar calibre is a very pressing problem that must be faced, not only by your group but by the Government. We feel the time is rapidly approaching when direction of labour into key rearmament industry must be envisaged.

Our best hope of avoiding a third world war is to be prepared. In the last war your company produced over 40,000 aeroplanes and over 38,000 engines. That was a great achievement. But do remember that that kind of production cannot be achieved overnight. We of the Hawker Siddeley Group are prepared to play our full part in the rearming of Britain, the Commonwealth and Western Europe. But we believe the time to start is to-day—to-morrow may well be too late.

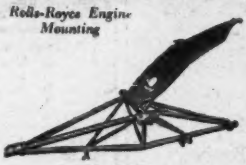
The report and accounts were adopted

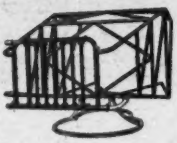
THE VALUE OF *Individual* TECHNIQUE

'Mamba' Engine Mounting

Bristol Centaurus Ring

Rolls-Royce Engine Mounting





A light steel tubular structure produced for Messrs. Armstrong Siddeley Motors Ltd., for de-icing tests on a 'Mamba'-engined Lancaster.

REYNOLDS

Over 50 years' experience in the manufacture, manipulation and fabrication of Steel Tubes and Tubular Structures has established the fame of Reynolds in the Aircraft Industry.

REYNOLDS TUBE CO. LTD - TYSELEY - BIRMINGHAM, 11

When asked, as we frequently are,
What do you do at Airtech?
we often reply:

We are renderers of unusual services

Having our own aerodrome, adequate hangar space, well equipped workshops and design office with a staff of versatile technicians and skilled engineers, there are few tasks which we cannot tackle with enthusiasm and at reasonable cost.

As an example,
here is one of our renderings—

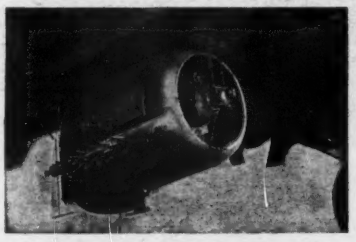


Illustration shows a HERCULES power plant ingeniously and very *securely* attached in the bomb bay of a HALIFAX aircraft for delivery to Pakistan. Design and manufacture of equipment for this unusual task was carried out at Thame Airport.

So, if you ever have need of
unusual aeronautical engineering services,

AIRTECH
is the name

AIRTECH LTD., AYLESBURY and THAME AIRPORT, HADDENHAM, BUCKS
Telephone: AYLESBURY 1163

Electric Equipment
for Aircraft
B
T-H
With unrivalled manufacturing resources backed by continual research and development and fifty-four years' experience, BTH enjoys an enviable reputation for the quality of its products. Reliability is of prime importance on land, but is vital in the air, hence the success of BTH aircraft magnetos and electrical equipment, including:
Motor-generating sets with electronic regulators · Gas-operated turbo-starters · A.C. and D.C. Motors · Actuators · Generators
BRITISH THOMSON-HOUSTON
THE BRITISH THOMSON-HOUSTON CO., LTD., COVENTRY, ENGLAND
A1041

Member of the AEI group of companies

For Twin Wheel Aircraft

SKYHI

SPECIALLY DESIGNED HYDRAULIC

JACKS

of narrow width that easily go between the twin-nose wheels.

Ball or Flat Head as required.

Model S.2061.
38,000 lbs. capacity.
11" closed height.
11" Hydraulic Lift.
Overall width. 5".

Model S.869.
18,000 lbs. capacity.
6" closed height.
6½" Hydraulic Lift.
Overall width. 5".

SKYHI LIMITED "SKYHI" WORKS,
WORTON ROAD, ISLEWORTH, MIDDX.
Telegrams, SKYHIJACK PHONE LONDON. Telephone, HOUNSLOW 2211/2/3

FLIGHT REFUELLING MEANS UNLIMITED RANGE INCREASED PAYLOADS AND HIGHER PROFITS

Triumphing over the limitations of range and endurance, the Flight Refuelling Service now has all the facilities required for the safe and efficient refuelling in flight of the fastest jet airliners.

FLIGHT REFUELLING LIMITED
TARRANT RUSHTON AIRFIELD, BLANDFORD, DORSET

E. S.
ASTON
& CO. LTD.

MACHINISTS OF PLASTICS
(APPROVED BY A.I.D. & A.R.B.)

Instrument Panels, Cleats, Fairleads, Packings and Control Knobs, machined from Laminated Plastic and Cast resin.

5, SEBASTIAN STREET, LONDON, E.C.1.
Phone Clerkenwell 2179

A.G.S.
B.S.S.
S.B.A.C.

Brown Brothers (AIRCRAFT) Ltd.

Aircraft and General Engineers - HOUGHTON ROAD · NORTHAMPTON

JJH

STEEL STRIP

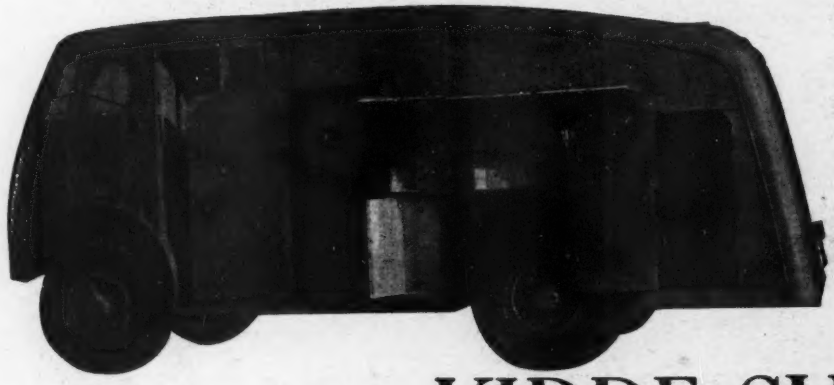
SHEETS AND SECTIONS
TO A.I.D. SPECIFICATIONS

HABERSHON

ROTHERHAM

"My word,—that's clever"——"What is old man?"
"This passenger comfort in the air business"——"Is it?"
"Well, if flying over the north pole in a lounge suit can be called clever"——
——"There must be more gadgets than passengers"
"Oh, there are old man"——
——"Be terrible if they all went haywire"
"Who?"——"The gadgets"
"Oh rather"——"Ever heard of Teddington Controls?"
"No"——"Neither have I old man"

CEFN COED, MERTHYR TYDFIL, SOUTH WALES



KIDDE-SUN
CRASH TENDER

The SUN air foam pump, mounted on a Thornycroft all-wheel drive chassis, will deliver 2,500 g.p.m. of foam—total 4,500 gallons of foam. The KIDDE CO_2 equipment will discharge 500 lbs. of CO_2 per minute—total 900 lbs. CO_2.

***The* WALTER KIDDE COMPANY LTD. NORTHOLT, MIDDLESEX.**
Telephone: WAXlow 1061
SUN ENGINEERING *(RICHMOND)* LTD. KINGSTON-ON-THAMES.
Telephone: KINgston 7497

FLIGHT

CLASSIFIED ADVERTISEMENTS

Prepaid Advertisement Rates: 3/- per line, minimum 6/-, average line contains 6-7 words. Special rates for Auctions, Contracts, Patents, Local and Official Notices, Public Announcements, Tenders, 4/- per line, minimum 8/- per paragraph. Box Number facilities available for the convenience of private advertisers, add 2 words plus 1/- to defray the cost of postage and forwarding replies. Press day, FIRST POST THURSDAY, or one day earlier at Branch Offices. No responsibility accepted for errors. Remittances payable to: Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1.

AIRCRAFT FOR SALE

FIELDS

AMONG the outstanding bargains we have to offer are the following:—

D.H. Rapide, low hours, 12 months C. of A., 7-passenger seats; only £1,350; or could be supplied with 9 seats at small extra cost.

CONSUL, excellent condition, 6 seats (passenger) radio, C. of A.; £875.

PROCTOR IV, excellent condition, radio, C. of A., very low hours; £600.

THESE are only a few of the large selection of aircraft we have for disposal ranging from the smallest private aeroplanes to the large passenger and freight liners.

WRITE or 'phone for further details to:—

FIELD AIRCRAFT SERVICES, Ltd., 'Phone Croydon 7777, Croydon Airport Croydon, Surrey Cables, Fieldair, Croydon. [0258

W. S. SHACKLETON

SHACKLETON, Ltd., 175, Piccadilly, London, W.1 (19 years at this address), Europe's biggest aeroplane dealers, offer the usual interesting list of assorted flying machines, of which details are given below.

WE are privileged in being able to offer a fleet of aeroplanes, the property of a charter company temporarily suspending operations but renowned for the quality and maintenance of their aeroplanes; these include the following two, which are of exceptional interest:—

£XXXX.—A very special and unique Rapide, built by and collected from De Havillands, with one owner only—the present one—since new; it was completely converted and redesigned, regardless of expense, so that full airline radio could be carried in addition to six passengers, amounting to a payload of 1,250lb; extra equipment includes STR 16/17, STR 9, VHF, SBA, and DF loop; cabin upholstered by Rumbold, with six seats; low hours, current C. of A. and in first-class condition inside and out.

ALSO:—

£350.—Percival Proctor I, 4-seater, current C. of A., fully upholstered, with completely overhauled engines, Murphy VHF radio, low hours. Both machines seen near London.

£350.—D.H. Fuss Moth, an exceptional little aeroplane, offered with new C. of A., recently completely rebuilt, full blind flying panel, folding wings, nearly new engine.

£295.—Piper Coupe, an economical little side-by-side aeroplane with 65hp Continental engine, low hours, current C. of A.; £200 has just been spent on this machine to bring it up to a really high standard.

£575.—Percival Proctor V, a really good one, new in 1947 and flown only 180 hours, twelve months' C. of A., with modifications to date, and fitted with full dual control and long-range tanks.

£550.—Fairchild Argus, an exceptional one of its kind, fitted with full dual control and upholstered in blue leather by Rumbolds; it possesses all possible refinements, such as full blind flying panel, navigation and landing lights, starter and battery; engine is modified for long life and run only 150 hours.

£1100—Avro Anson, in condition as new, new C. of A., new fabric throughout, red leather upholstery, painted to customer's requirements.

£675.—Miles Monarch, a very superior aeroplane with a long-term Certificate; fitted with directional gyro and artificial horizon, navigation lights and metal propeller.

W. S. SHACKLETON, Ltd., 175, Piccadilly, London, W.1. Tel. Regent 2448/9. Overseas cables: 'Shackhud, London." [0070

PROCTOR V, as new condition, 13 months' C. of A., new engine, propeller nil hours since overhaul; twin channel Murphy V.H.F.; best offer secures.—Box 7645. [5782

ANSON Mark I freighter, early delivery, with 12 months' C. of A., fully modified with low hours both airframe and engine, T/R 1154/55 radio; payload 1,845lb; 7 passenger seats can be fitted if required.—Box 7647. [5781

SEA Otter single-engine Amphibian, brand new, test flown only 3 hours; practically completed C. of A., for sale as lying England; sacrifice price £5,000.—Autocars (Worcester), Ltd., Aircraft Division, 51, Sidbury, Worcester. [0599

FLYING EQUIPMENT

Fully sheepskin lined HORSEHIDE GAUNTLETS. Black or Tan 58/6. Brand new WHITE SILK INNER GAUNTLETS 5/9. Brand new FLYING GAUNTLETS complete with electrically heated INNER GLOVES 12 or 24 volt 29/9. FLYING JACKETS both American and ENGLISH IRVINE in stock. DALTON COMPUTORS. Brand new 50/-. WHITE FLYING SUITS now in stock. Fully Zipped 65/-, buttoned 35/-. Gosport Tubes Civilian pattern 10/-. R.A.F. Pattern 12/6.

EX-R.A.F. SUN GLASSES Mk. VIII complete in case. These glasses are light in weight and very comfortable in fitting. In medium or large sizes, 21/- per pr. Post 9d.

Mark VIII goggles. Brand new. Fitted clear safety lenses and complete with spare pair of tinted lenses, 22/6. Mark VIII goggles, clear lenses, only 10/6. Post 6d. Spare lenses tinted 2/9, or clear 5/- per pr.

LUXOR GOGGLES 50/-. R.A.F. Outer FLYING SUITS Brand New 42/6. FUR COLLARS for fastening to any coat or jacket, brand new, 12/6. Black or Tan.

FLYING BOOTS fully lined with White Lambswool 90/-.

ALL GOODS ARE SENT POST FREE. SPECIAL TERMS TO FLYING CLUBS. TRADE SUPPLIED AT KEENEST PRICES. SEND 3d. IN STAMPS FOR ILLUSTRATED CATALOGUE.

D. LEWIS LTD. (Dept. F.)

Leather Clothing Manufacturers for Home or Export

124, GT. PORTLAND ST., LONDON, W.1

Trade Enquiries Invited

Tel.: Museum 4514 Tele.: Aviabit, Wesdo, London.

EXPORT PACKERS

WE HAVE A COMPREHENSIVE STOCK OF PAPERS, WADDINGS AND EQUIPMENT FOR IMMEDIATE DELIVERY TO FIRMS ENGAGED IN THE ABOVE WORK.

STARAVIA

Blackbushe Airport, Camberley, Surrey.

Tel.: Camberley 1600.

EAGLE AVIATION

Limited

announce the purchase of an additional three Avro York aircraft making a total of six available for world wide charter. 45 passengers or 9 tons freight. Aircraft sale and purchase.

Head Office: 29 Clarges Street, London, W.1 *Telephone:* GROsvenor 6411 *Cables:* Speedjode Audley London. Maintenance & Operations—Luton Air port, Luton, Bedfordshire. *Telephone:* Luton 5787

AIRCRAFT FOR SALE

R. K. DUNDAS, Ltd.,

FOR all aircraft, spares and aviation equipment.

AVAILABLE now:—

GEMINI, low hours, full C. of A.

RAPIDE, fully equipped.

DOVES.

R. K. DUNDAS, Ltd.,

29, Bury St.,

LONDON, S.W.1.

WHITEHALL 2848.

CABLES: Dundassero, London. [0359

TIGER Moths, £375; Proctor III, £250; Auster-Lycoming, £225; Auster-Cirrus 1, 2-seater, £250. All above with 12 months C. of A.

YORKSHIRE AVIATION SERVICES Ltd., York Aerodrome. Tel 54854 and 543841. [0706

CENTRAL AERONAUTICAL BUREAU, Ltd.—Aerovan, £550; Anson, £350; Tigers, £300; Consuls, £500; Proctors, £300; Fairchild, £250; Lodestar, £4,450; Dak, £13,000; for sale, exchange for aircraft or cars.

C.A.B., Ltd., Croydon 3382. Cro. 7744, ex. 109. [0620

AIRCRAFT WANTED

WE are always buyers of Dakota aircraft.—Aerocontacts, Ltd., Gatwick Airport, Horley, Surrey. Tel. Horley 1510. [5731

W. S. SHACKLETON, Ltd., are urgently in need of a good used Auster Autocrat, low hours, accident free history, and sand-cast cylinder heads highly desirable if possible.

W. S. SHACKLETON, Ltd., 175, Piccadilly, London, W.1. Tel. Regent 2448/9. [0071

R. K. DUNDAS, Ltd.—We have a brisk demand from home and overseas, send us details of anything you have to offer aircraft, engines, spares, etc., etc.—R. K. Dundas, Ltd., Aviation Division, 29, Bury St., London, S.W.1. Whitehall 2848. [0358

VENDAIR AIRCRAFT SERVICE AND SALES, Croydon Airport, require five Auster aircraft with or without C. of A., one four-seater light aircraft, one Dakota aircraft or airframe, four Lycoming engines, etc., etc.—Vendair, Croydon 5777. [0605

AIRCRAFT ACCESSORIES AND ENGINES

MAJORS 1830/92, 985's Q.III's, Cheetah 9, 10's and 15's.

C.A.B., Ltd. Croydon Airport, Surrey. Croydon 3382. Cro. 7744, ex. 109. [0621

AIRCRAFT bulbs, fuses, switches, instruments, radio parts and numerous other accessories, British and American.—Suplex Lamps, Ltd., 239, High Holborn, W.C.1. [5739

HOME and overseas aircraft operators, don't waste time and money unnecessarily, if in need of British and American instruments, electrical accessories and ancillary equipment, first contact

LITCO FLIGHT AIDS, Station Approach, Boxmoor, Herts. Tel. Boxmoor 1564. Grams: "Litco Flight Aids, Boxmoor, Herts." [0613

AIRCRAFT ACCESSORIES AND ENGINES WANTED

URGENTLY wanted, following types of engines for purchase: R 985-AN1 or AN3, 1830-92, 1830-90D or 90C, Cheetah IX; overhauled or time expired.—Reply to Box No. 209, Allardyce Palmer, Ltd., 109, Kingsway, London, W.C.2. [0262

AIR CHARTER

BROOKLANDS AVIATION, Ltd. — Proctors and Rapides available for air charter at Brooklands Aerodrome. Weybridge (Tel. Byfleet 436); Aywell Aerodrome, Northampton (Tel. Moulton 2135.1); Shoreham Airport, Sussex (Shoreham 2366). [0306

AIRCRAFT SERVICING

F. G. MILES, Ltd., Redhill Aerodrome, Surrey. Nutfield Ridge 2200.

AN approved design, maintenance and repair organisation staffed by experts on Miles aircraft, Major and Minor modifications a speciality; radio installations.

APPROVED instrument test shop; specialists in race preparations.

F. G. MILES, Ltd., Redhill Aerodrome, Surrey. Nutfield Ridge 2200. [0591

(Continued on next page)

Jubilee PATENTED WORM DRIVE CLIP

the finest CLIP in the world

L. ROBINSON & CO. (GILLINGHAM) LTD.

Gillingham, Kent

AIRCRAFT SERVICING

BROOKLANDS AVIATION, Ltd., Brooklands Aerodrome, Weybridge.—C. of A. overhauls, modifications and conversions.—Tel. Byfleet 436. [0305

REPAIRS and C. of A. overhaul for all types of aircraft.—Brooklands Aviation, Ltd., Civil Repair Service, Sywell Aerodrome, Northampton. Tel. Moulton 3361. [0307

HERTS & ESSEX AERO CLUB.—Repairs, maintenance and overhauls on Rapides, Proctors, etc., at competitive prices; hangarage, estimates free; C. of A. overhauls promptly carried out.—Broxbourne Aerodrome, Nazeing, Essex. Tel. Hoddesdon 2421, 3705 and 2453. [0596

CARAVANS

D.R.O.s No. 1067.

ATTENTION all ranks. S/D.

6.—Welfare. All ranks with accm. problems will proceed as soon as practicable (subject to the exigencies of the service) to the F.O.C. Caravan Centre, where amongst the selection of 30 pedigree caravans by England's leading mfrs. displayed in centrally heated showrooms, a solution to their problem will be found. Those who are prevented by duty from attending this parade, should send postcard without delay for full details.

F.O.C. CARAVAN CENTRE, Dept. A, 200-220, Cricklewood Broadway, Edgware Rd., N.W.2. Gladstone 2234. Open daily 8.30-6 p.m., Sundays 11-4. [0307

FOR all types of caravans, living or holiday, write for catalogue to Country Life Caravans, Romsey. [0596

HOME or hire.—Let ex-Servicemen help the Services: give us your housing worries or forget them on a holiday arranged by the Pathfinder Caravan Co., Ltd., Tedburn St. Mary, nr. Exeter. C.D.A.A. Member. [0578

BERKELEY and Glider caravans, Ambassador, £950; Courier Standard £450, Courier de luxe £499; New Messenger £550; Flyte four-berth £307/10; Flyte two-berth £189.—Full particulars from Mantle's Garages, Ltd., Biggleswade, Beds. Tel. 2113. [0367

X.L. CARAVANS, Ltd., hold finest selection of caravans for homes and holidays; see the new Winsome Craftmaster, Pioneer Premier, Marlow Tudor, Lamford Cavalier Victor, Challenger, Willerby Weyland Safari, etc., prices from £196; easiest terms.—X.L. Caravans, Ltd., Blue Star Garage, Maidenhead. Tel. Maidenhead 2747. [0606

CARAVAN hunting done with Huntingdon Berkeley, Raven, Eccles, Paladin, Westway, Sunbeam-Eagle, Rochford. The wonderful Willerby range from £305. See them all and bring your cheque book.—Come to Francis Huntingdon Caravans, Main Brighton Road, Coulsdon, Surrey (adjoining Coulsdon South Station). Uplands 5901. Open daily to dark. [0705

CARAVAN towing service, 1/6 per mile towed, pick-up point to destination, modern saloons, includes 3/4 passengers, full insurance on passengers and tow; special rates for long distance and service personnel, let us quote; sell drive cars and caravans for hire, send for descriptive booklet "Caravan Holidays the Osborne Way."—The Osborne Motor Co., Ltd., Osborne Road Garage, Southsea, Hants. Portsmouth 74218. [0705

CLOTHING

R.A.F. and R.N. officers' uniforms purchased; large selection of R.A.F. officers' kit for sale, new and reconditioned.—Fisher's Service Outfitters, 86-88, Wellington St., Woolwich. Tel. Woolwich 1056. [0567

CLUBS

REDHILL FLYING CLUB, Redhill Aerodrome, Surrey, for instruction.—Nutfield Ridge 2245-3234. [0346

HERTS & ESSEX AERO CLUB, Broxbourne Aerodrome, Nazeing, Essex, M.C.A. approved 30-hour course; solo flying from 30/- per hour; residential; trial lesson, 35/-; train from Liverpool St. or Green Line Coach 715.—Tel. Hoddesdon 2453, 2421, 3705. [0230

CONSULTANTS

WING COMMANDER R. H. STOCKEN, F.R.Ae.S., Eagle House, 109, Jermyn St., London, S.W.1. Tel. Whitehall 8863 [0419

HOTELS AND ACCOMMODATION

ROYAL OAK HOTEL, Keswick-on-Derwentwater, heart of English Lake District, offers restful holiday to Air Force personnel; first-class accommodation at reasonable charges [0414

INSURANCE

ALL types of aircraft insurance and personal accident cover.—Apply to J. W. T. Amey, Messrs. R. J. Medlin & Co., Percy House, 796, High Rd., Tottenham, N.17 Tottenham 2003-4-5. [0594

PACKING AND SHIPPING

R. & J. PARKS, Ltd., 143/9, Fenchurch St., E.C.2. Tel. Mansion House 3083, official packers and shippers to the aircraft industry. [0012

TIME RECORDERS

STAFF time checking and job-casting time recorders (all makes) for quick cash sale; exceptional condition.—Box 7341. [0040

TIME recorders, service rental.—Tel. Hop 2339. Time Recorder Supply and Maintenance Co., Ltd., 157-159, Borough High St., S.E.1. [5093

TUITION

A. & G. T. Hamble is the World's Premier Civil Aeronautical Training Establishment. [0527

The HYMATIC ENGINEERING CO. LTD.
REDDITCH WORCS.
Applications are invited from
SENIOR DESIGNERS
DRAUGHTSMEN
DEVELOPMENT ENGINEERS
for interesting work on Air Compressors, Pneumatic Systems and other specialised equipment.
Please write giving full particulars and salary expected.

AIRCRAFT SPRING WASHERS

CROSS MFG. CO. (1938), LTD.
COMBE DOWN, BATH

R.A.F. UNIFORMS
FOR OFFICERS AND W.O.s
— NEW AND RECONDITIONED —
HUGE SELECTION IN STOCK
FISHERS, 86/88 Wellington Street, Woolwich, S.E.18 Phone: 1055

The . . .
British Air Line Pilots' Association
SUITE 6, 9-10 MARBLE ARCH, W.1
Tel.: AMBassador 1357
Membership open to all Commercial and Service pilots. For full details as to objects and particulars of Membership please write to Secretary.

COTTON BAGS
FOR SPARE PARTS, Etc.
WALTER H. FELTHAM & SON, LTD.,
Imperial Works, Tower Bridge Road,
Telephone: HOP 1784. London, S.E.1

TUITION

THE College of Aeronautics.

A COURSE of lectures on

"MEASUREMENTS for Management"

WILL be given at the College from

MONDAY, 9th April, to Friday, 20th April, 1951.

THIS course is intended to familiarise executives in any industry with the modern practices and new developments in measurement of management factors in the following fields; work measurement, financial and cost measurements, dimensional measurements, machine tool and process plant measurements. The course will discuss special aspects such as quality control, job evaluation and modern methods of cost accountancy. Laboratory demonstrations will be available in each of the subjects covered by the syllabus.

FEES for the course are: Tuition fee, 15 guineas. Residence charge (including full board), 16/- per day.

COPIES of the syllabus and forms of registration can be obtained from the Registrar, The College of Aeronautics, Cranfield, Bletchley, Bucks. [5794

SPECIAL inclusive rates to members Elstree Flying Club; instruction on Cirrus Austers (M.C.A. approved course), dual and solo, 37/6 per hour.—Tel. Vic. 1300 or Els. 3070. You may never get this chance again! [0702

TUITION

AERONAUTICAL engineering.—Full-time practical and works training. Entrance by means of probationary term.—Syllabus from the Secretary, College of Aeronautical & Automobile Engineering, Sydney St., Chelsea, S.W.3. Flaxman 0021. [0019

LEARN to fly for £24, instructors' licences and instrument flying for £3 an hour; night flying £3/10 an hour, residence 4½gns weekly, approved M.C.A. private pilot's licence course.—Wiltshire School of Flying, Ltd., Thruxton Aerodrome, Andover, Hants. [0253

AIRCREW technical training for civil aviation pilots' and flight engineers' issues and endorsement licences. Day and evening courses for M.C.A. examinations.—College Secretary, College of Automobile & Aeronautical Engineering, Sydney St., Chelsea, S.W.3. Flaxman 0021. [0041

SOUTHEND Municipal Flying School. Tel. Rochford 56204. No entrance fee, no subscription. M.C.A. approved for 30-hour course for private pilot's licence. Auster aircraft fitted with V.H.F. radio and two-stage amber for instrument flying—solo from £2/18/4 per hour, dual from £3/3/4 per hour.

REDUCED rates for Continental Flying—solo from £2/11/8 per hour, dual from £2/16/8 per hour; night flying, £4/6/4 per hour, dual or solo. Link Trainer 10/- per hour. Instructor's Courses. Flying training to commercial licence standard, restaurant and residential accommodation. [0332

A.F.R.Ae.S., A.R.B., Certs., A.M.I.Mech.E., etc., on "no pass—no fee" terms, over 95% successes.—For details of exams. and courses in all branches of aeronautical work, navigation, mechanical eng., etc., write for 176-page handbook—free.—B.I.E.T. (Dept. 702), 17, Stratford Place, London, W.1. [0707

SCHOOL OF NAVIGATION, University College, Warsash, Southampton.—Flight navigator's course, £16/10 for six months' tuition; pilot licences £7/10 to £13/10 for six months' tuition; Link instructions; all approach systems, 10/- per hour or £3/10 for ten hours; postal course; hall of residence.—Tel. Locks Heath 2161. [0557

SITUATIONS VACANT

AIR SERVICE TRAINING, Ltd., require:—

STAFF pilots with the following qualifications:—

(1) Previous R.A.F. experience as pilot.

(2) Twin engine experience, preferably on Anson Mk. 21.

NAVIGATION instructors for air and ground duties; qualifications:—

(1) Previous R.A.F. experience as navigator.

(2) Flight navigators' licence; service or civilian equivalent considered provided licence is obtained within one year.

STAFF signallers:—

MUST have had previous R.A.F. air crew signaller experience and should have technical knowledge up to the standard of the M.C.A. Provisional Air Licence.

ALL applicants for the above posts should be members, or must become members, of the R.A.F. Reserve.—Detailed applications to the Commandant, Air Service Training, Hamble, Hants. [0330

FLIGHT REFUELLING, Ltd., have the following vacancies in their technical office:—

(1) Stressman. Candidates should have minimum qualification H.N.C. (Mech.) and experience of stressing aircraft components and installations to M.O.S. and A.R.B. requirements.

(2) Flight test observer, minimum qualification as for (1) above; some experience of flight testing technique desirable.

THE company has an interesting programme of research and development work; applicants should state age, qualifications, experience and salary required.—Personnel Manager, Tarrant Rushton Airfield, nr. Blandford, Dorset. [5800

AIRWORK LIMITED have vacancies at home and overseas for aircrews in the following categories:

1.—Pilots; minimum qualifications: commercial pilot's licence with an instrument rating.

2.—Radio officers; minimum qualifications: 1st class P.M.G. licence; home-based vacancies only.

3.—Flight engineer officers; minimum qualifications: flight engineer's licence or ground engineer's A or C licence; home-based vacancies only.

APPLICATIONS in writing with full details of licences, past experience, etc., and stating whether overseas post is desired should be addressed to:

OPERATIONS Manager,
AIRWORK LIMITED,
BLACKBUSHE Airport,
NEAR Camberley,
SURREY

THESE should all be clearly marked on the outside "AIRCREW Application/F." [5787

LINK Trainer Instructor required for No. 2 Reserve Flying School, Barton Airport, Manchester; state qualifications, etc. [5806

SENIOR Commercial Pilot required, instrument rating R/T. Rapides.—Write, Jersey Airlines, 4, The Parade, St. Helier, Jersey, C.I. [5807

MALE and female inspectors urgently required by aircraft constructors in the West.—Apply, giving age, experience, etc., to Box 7758. [5706

JIG and tool draughtsmen, experienced, required.—Apply Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge. [5811

SITUATIONS VACANT

A. V. ROE, CANADA, Ltd., Malton, Nr. Toronto, Ontario, have vacancies in their gas turbine engineering division for the following:—

1.—Aero engine development engineers experienced on mechanical and performance development and analysis.

2.—Experienced flight test engineers.

3.—Aerodynamicists and thermodynamicists experienced on aircraft gas turbine component design.

4.—Aerodynamic test engineers experienced in compressor and turbine test procedure.

5.—Test engineers experienced on gas turbine test equipment design or on engine testing.

APPLICATION forms may be obtained from, and when completed should be returned, together with photograph or clear snapshot, to:—

DEPARTMENT OF LABOUR OF CANADA, Sackville House 40, Piccadilly, London, W.1. [5802

WANTED, navigation instructor for reserve flying school.—Apply Secretary, Universal Flying Services, Ltd., Fair Oaks Aerodrome, Chobham, Woking, Surrey. [5767

GOOD senior draughtsman required for interesting programme of new work.—Apply in the first instance to the Chief Engineer, Percival Aircraft, Ltd., The Airport, Luton. [5593

VACANCIES exist for two VHF/DF homer operators. —Applicants should write, giving full details of experience, to Manager, Airwork, Ltd., Booker Aerodrome, nr. Marlow, Bucks. [5795

APPLICATIONS are invited from design draughtsmen and stressmen also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero engines.

APPLICATIONS should state full particulars of experience and qualifications and should be addressed to The Personnel Manager, The de Havilland Engine Co., Ltd., Stonegrave, Edgware, Middx. [5575

SENIOR draughtsmen required; previous aircraft experience desirable; pension and life assurance scheme.—Apply Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge. [5565

STRESSMEN, preferably with at least five years' experience on aircraft structures, required for very interesting and varied programme of work.—Apply Portsmouth Aviation Developments, Ltd., The Airport, Portsmouth. [5773

AERONAUTICAL and mechanical engineers are required by the Ministry of Supply to fill unestablished appointments in the Experimental Officer class at research and development establishments, mainly in the south of England.

CANDIDATES should possess a Higher National Certificate or an equivalent qualification in Mechanical or Aeronautical Engineering, but higher qualifications, e.g., a degree in Engineering, would be an advantage. Candidates should have had experience on experimental work.

SENIOR experimental officers (minimum age 35), £735–£955 London, £705–£895 provinces.

EXPERIMENTAL officer (minimum age normally 28), £525–£675 London, £495–£645 provinces.

ASSISTANT experimental officer £230 (at age 19)—£490 London; £220 (at age 18)—£460 provinces; (rates for women somewhat lower).

WRITE for application form (quoting reference number C679-50A) to Ministry of Labour and National Service, Technical and Scientific Register (K), York House, Kingsway, London, W.C.2. [5793

AIRCRAFT loftsmen (senior) required, sound experience in similar capacity essential.—Applications in writing, stating age, experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., The Airport, Luton, Beds. [5595

AIRCRAFT draughtsmen with mechanical experience required for experimental and development work; apply stating age, experience and salary required to—Chief Draughtsman, M.L. Aviation Co., Ltd., White Waltham Aerodrome, Berks. [5786

SENIOR & Junior Design Draughtsmen with experience in light hydraulic servo controls and/or fuel metering equipment; also technicians with development experience in this field.—Write Personnel Manager, Dowty Equipment, Ltd., Arle Court, Cheltenham. [5776

DRAUGHTSMEN, senior and junior, jig and tool and aircraft, required for work on interesting and varied projects; pension scheme; full details of experience, etc., in writing to—Personnel Manager, Fairey Aviation Co Ltd., Hayes, Middx., quoting reference DO/A1. [5765

PLANNING engineer, sheet metal, required, preferably with experience of manipulating and welding of stainless steel; experience of rate fixing an asset.—Apply The Personnel Officer, The De Havilland Engine Company, Ltd., Leavesden Aerodrome, Leavesden, Nr. Watford, Herts. [5613

THE de Havilland Aircraft Co., Ltd., have vacancies for a technical author and technical illustrators, previous aircraft experience essential.—Apply in writing, stating age, experience and salary required, to Chief Draughtsman, The de Havilland Aircraft Co., Ltd., Hatfield, Herts. [5720

TECHNICAL auther required for description of aircraft hydraulic equipment for Ministry of Supply and Air Registration Board handbooks and for technical publicity; good general education and experience of similar work.—Apply Personnel Manager, Electro-Hydraulics Ltd., Warrington, Lancs. [5801

AERODYNAMICIST (male) required, degree in mathematics or engineering and several years' practical experience in aerodynamics section essential. —Applications in writing, stating age, experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds. [5598

TECHNICAL assistant required; an interesting vacancy occurs in the test laboratory of Delaney Gallay, Ltd., Edgware Rd., Cricklewood, N.W.2, for a young man, 20-25, in connection with the testing of heat exchange equipment.—Please apply in writing, stating age, qualifications, experience and salary. [5813

Aero & Jig & Tool Draughtsmen in Great Demand

MEN AND YOUTHS

There is an insatiable demand for Aero, Jig and Tools, etc., Draughtsmen and Inspectors. So acute is the present shortage that employers are only too anxious to engage those with no previous practical experience who are able to prepare neat and accurate drawings.

QUALIFY AT HOME—IN SPARE TIME

After brief, intensely interesting study—undertaken at home in your spare time—*YOU* can secure an attractive and interesting post as **Aero-Draughtsman**. Numerous vacancies are also available in **Electrical, Mechanical, Plastics,** etc. branches of Draughtsmanship

FREE GUIDE

The Free Guide contains 132 pages of information of the greatest importance to those seeking such success compelling qualifications as **A.M.I.Mec.E., A.F.R.Ae.S., A.M.I.P.E., Gen. Cert. of Educ., and B.Sc.,** etc., also **R.A.F. Entry** (Maths, etc.), together with particulars of our remarkable Guarantee of

SUCCESS—OR NO FEE

Write now for your copy of this remarkable publication. It may well prove to be the turning point in your career

NATIONAL INSTITUTE OF ENGINEERING

(Dept. 427), 148-150, HOLBORN, E.C.1

(South Africa Branch E.C.S.A., P.O. Box 8417, Johannesburg).

THE MINISTRY OF CIVIL AVIATION

offer the undermentioned aircraft

FOR SALE

VIKING MK. 1A (G-AGRR)

Certificate of Airworthiness expiry date: 15th Sept., 1950.

GEMINI (G-AJZL)

Certificate of Airworthiness expiry date: 21st Feb., 1951.

PROCTOR (G-AGIJ)

Certificate of Airworthiness expiry date: 14th May, 1951.

Limited quantities of spares for these aircraft are also available.

All of these aircraft are from the M.C.A. Civil Operational Fleet and are fully maintained

For further details or for permission to view apply in writing to:-

THE MINISTRY OF CIVIL AVIATION

FAB 3, ARIEL HOUSE, THEOBALDS ROAD, LONDON W.C. 1.

SITUATIONS VACANT

SENIOR progress engineer required to organise and control progress department of a firm engaged on conversion and refurbishing varied types of aircraft; good prospects for the right type of man; apply stating age, experience and salary required to—Field Aircraft Services, Ltd., Nottingham Aerodrome, Nottingham. [5809

SENIOR Technical Assistant required for aero engine stress office; knowledge of reciprocating and gas turbine engines desirable, B.Sc. or equivalent preferred, write giving age and full details of previous experience and salary required to—The Personnel Officer, The de Havilland Engine Co Ltd., Stag Lane, Edgware, Middx. [5753

ELECTRICAL field service representative required by aircraft manufacturers' service department in the south; applicants must possess extensive knowledge and outstanding practical experience of the servicing and repair of modern aircraft electrical systems; a current "A" licence and a flair for service work.—Box 7971. [5744

APPLICATIONS are invited from senior and intermediate design draughtsmen, experience of aero engine design desirable but not essential.—Please write, stating age and giving details of previous experience in chronological order, to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [5449

THE DE HAVILLAND AIRCRAFT Co., Ltd., have vacancies for senior design and intermediate draughtsmen (preferably with aircraft experience) in their Hatfield and London (Regent Street) offices.—Applications stating age, experience and salary required, to Chief Draughtsman, de Havilland Aircraft Co., Ltd., Hatfield, Herts. [5584

NORMALAIR, Ltd., invite applications from first class senior production drawing office checkers for light mechanical and precision equipment for aircraft pressurising and air conditioning systems.—Written applications, stating age, qualifications, experience and salary required, to the Personnel Officer, Normalair Ltd., Yeovil, Somerset. [5771

A. V. ROE, CANADA, Ltd., Malton, Near Toronto, Ontario, have a vacancy in their gas turbine engineering division for a graduate physical metallurgist with 2-3 years' experience on gas turbine metallurgical failure investigations and metallurgical processing. The post will involve night work and candidate should preferably be under 25 and single.

APPLICATION forms may be obtained from, and when completed should be returned, together with photograph or clear snapshot, to:—

DEPARTMENT OF LABOUR OF CANADA, Sackville House, 40, Piccadilly, London, W.1. [5803

ARMSTRONG SIDDELEY MOTORS, Ltd., have vacancies for senior and junior technical assistants in the Mechanical Engineering Department; interesting work on vibration of gas turbine engines, bearing and gear research, structure testing, etc.; qualifications should include degree or Higher National Certificate; previous experience desirable but not essential.

ALSO vacancies for junior technical assistants (female) for interesting mathematical work; previous experience unnecessary.—Apply Experimental Engineer (Mechanics), Armstrong Siddeley Motors, Ltd., Coventry. [5796

SENIOR aerodynamicists required for work on high-performance aircraft; applicants should have an engineering degree and experience in design of controls, performance calculations and estimation of aerodynamic loads.—Write, giving particulars of age, experience and salary required, to Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge. [5566

SENIOR jig and tool draughtsmen, capable of designing, with minimum supervision, tooling equipment for producing internal combustion engines; workshop background essential; advancement according to ability; staff canteen, 5-day week; write with particulars to—The Personnel Officer, The de Havilland Engine Co., Ltd., Stonegrove, Edgware, Middlesex. [5784

AIRCRAFT Draughtsmen are required by the English Electric Co., Ltd., to meet an expanding programme at their Warton and London design offices; draughtsmen of all grades with appropriate aircraft experience are invited to apply for these vacancies; write quoting ref. 120D to—Central Personnel Services, English Electric Co. Ltd., 24-30, Gillingham St., London, S.W.1. [5730

HANDLEY PAGE (READING), Ltd., have vacancies in their design office for stressmen who should have at least two years' experience and with qualifications up to A.F.R.Ae.S or B.Sc standard, these vacancies carry excellent prospects for the right men.—Send full particulars to the Personnel Officer, Handley Page (Reading), Ltd., The Aerodrome, Woodley, Reading. [5574

PRODUCTION planning and methods engineer required for development of aircraft factory in the Midlands; essentials are a good knowledge of production planning and manufacture; a good general aircraft knowledge and factory administrative experience; details of education, qualifications, experience and salary required to—Field Aircraft Services, Ltd., Nottingham Aerodrome, Nottingham. [5808

STRESS or mechanical test engineers are required for the Aircraft Division of the English Electric Co., Ltd., at Warton Aerodrome, near Blackpool; these are interesting vacancies on new projects offering good prospects to suitably qualified engineers experienced in either of these fields.—Write giving full details and quoting ref. 454B to Central Personnel Services, English Electric Co., Ltd., 24-30 Gillingham St. London, S.W.1. [5756

AERODYNAMICISTS with an engineering degree and good mathematical background are required for the Aircraft Division of the English Electric Co., Ltd., at Warton Aerodrome, near Blackpool; previous experience is desirable but suitably qualified engineers without previous experience in aerodynamics who desire to enter this field will be given necessary training.—Write giving full details and mentioning ref. 455B to Central Personnel Services, English Electric Co. Ltd. 24-30 Gillingham St. London, S.W.1. [5755

(Continued on next page)

THE AERONAUTICAL WORLD IS SAYING——DEAL WITH:—

ROLLASON ENGINES LTD.

CROYDON AIRPORT
Tel. CRO. 5151/3 CRO. 7744 Ext. 69.

LARGE STOCKS OF **DE HAVILLAND GIPSY MAJORS, QUEENS III's, II's, and I's—ARMSTRONG SIDDELEY CHEETAH IX's and X's**

ALL ENGINES HAVE BEEN SERVICED AND ARE READY FOR IMMEDIATE INSTALLATION
ENGINE HOURS VARY FROM NIL SINCE EITHER NEW OR COMPLETE OVERHAUL. QUANTITIES OF SPARES ALWAYS AVAILABLE.
MAY WE QUOTE FOR YOUR REQUIREMENTS.

VERY HIGHLY COMPETITIVE PRICES QUOTED

SITUATIONS VACANT

JIG and tool designer draughtsmen; experienced men required by large manufacturing company engaged on production of automobile and aircraft components, first class technical qualifications and good practical experience essential, excellent prospects, permanent positions, single lodging accommodation available; modern canteen, 5-day week.—Write, stating age, full details of qualification and experience, and salary required to Personnel Manager, Lockheed Hydraulic Brake Co., Ltd., Leamington Spa. [5792

MECHANICAL engineer, B.Sc. or Higher National, with practical experience in theory, design and testing of small hydraulic pumps, actuators and allied equipment, required at special English Electric Company Laboratory. Work entails design and development of complete systems and test rigs. Drawing office experience an advantage. The post is progressive and of an interesting nature. Commencing salary £500-£600 p.a. —Apply giving full details and quoting Ref. 491, to Central Personnel Services, English Electric Co., Ltd., 24-30, Gillingham St., London, S.W.1. [5805

HANDLEY PAGE, Ltd., have vacancies for senior design and intermediate draughtsmen, preferably with aircraft experience for their Cricklewood and Radlett offices; consideration will be given to applicants with experience in light structural or mechanical engineering, possession of O.N.C. or H.N.C. (Mech. or Elect.) an advantage; loftsmen with previous experience of full scale layout work or similar workshop practice; these vacancies are at the Cricklewood office only.—Applications, stating age, qualifications and details of experience, to Staff Officer, Handley Page, Ltd., Chicklewood, London, N.W.2. [5684

SITUATIONS VACANT

BRITISH EUROPEAN AIRWAYS invite applications for the post of development engineer (radio) at Northolt, for development of current aircraft radio equipment, inspection of technical defects and preparation of radio modifications; considerable experience of modern civil aircraft radio systems and technical qualifications not less than City and Guilds Radio Communication II or equivalent standard are essential; salary scale £620-£750 per annum.—Write, giving details of age, experience and qualifications, and quoting reference 10/51, to personnel Manager, B.E.A., Keyline House, Ruislip, Middlesex. [5798

BRITISH EUROPEAN AIRWAYS invite applications for the post of development engineer at Ruislip to work on aircraft heating, ventilation, pressurisation and de-icing systems; duties include liaison with manufacturers, flight testing, preparing operating techniques and modifications; previous experience of aircraft pressurization systems and flight observing essential; experience of thermal de-icing desirable; salary scale £620-£750 per annum.—Write, giving details of age, experience and qualifications, and quoting reference 9/51, to Personnel Manager, B.E.A., Keyline House, Ruislip, Middlesex. [5799

HIGHLY qualified scientist or theoretical engineer required by large aircraft firm in the Midlands for senior technical executive post; knowledge and experience in the fields of aerodynamics reaction motors, radio and radar an advantage; age preferably 35-45 years; interesting career with excellent prospects and participation in a profitable pension scheme; full particulars of qualifications, experience and salary required should be submitted to—Box 8264. [5810

SITUATIONS VACANT

BRITISH EUROPEAN AIRWAYS have vacancies for radio officers, applicants must possess current Ministry of Civil Aviation first class Radio Telephony Operator's Licence and have operated as an aircraft radio officer during the last 12 months; grade on entry will be Radio Officer Category B at a commencing salary of £450 per annum.—Requests for application forms should be sent by postcard to Personnel Officer, Flight Operations Department, B.E.A., Keyline House, Ruislip, Middlesex. [5797

SITUATIONS WANTED

AIRCRAFT designer, approved, with wide experience of the industry, would consider similar appointment, or an executive appointment with an allied firm in design, development, administration, etc.—Box 8235. [5604

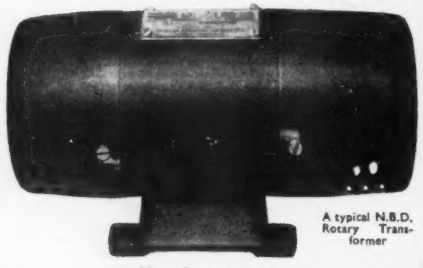
WANTED

PLATINUM-TIPPED sparking plugs wanted; we pay top prices.—M. Hayes & Sons, Ltd., 106, Hatton Garden, London, E.C.1. Holborn 8177. [5764

WE urgently require high-speed bars, high-speed solids and turnings, nickel, nickel chrome, and nickel chrome moly bars, billets or scrap, stainless cuttings, bars and sheets.
J. W. MAHER & SON, 4, Edward St., Sheffield, 3. Tel. 23782. [5593

STEEL, aluminium, brass and other non-ferrous sheets, strips, bars, off-cuts, any quantity, gauge, size; immediate payment.—Grades Sheared Metal Co., Ltd., Green Lane, Hounslow, Middlesex. Tel. Feltham 3274. [5757

NEWTON-DERBY



A typical N.B.D. Rotary Transformer

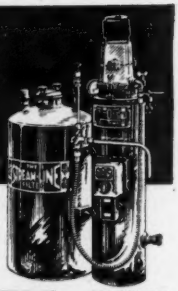
Manufacturers of:

ROTARY TRANSFORMERS
AIRCRAFT GENERATORS
and
AUTOMATIC CARBON PILE
VOLTAGE REGULATORS

ELECTRICAL PLANT
SPECIALISTS

NEWTON BROTHERS (DERBY) LIMITED
HEAD OFFICE & WORKS: ALVASTON ROAD, DERBY.
TELEPHONE: DERBY 45263 7 TELEGRAMS: DYNAMO, DERBY
LONDON OFFICE: IMPERIAL BUILDINGS, 56 KINGSWAY, W.C.2

Reduce
Transport Costs



Lower costs for oil — lower charges for maintenance — longer periods between overhauls all result from the regular cleaning of oil by the Stream-Line Filter. It pays for itself in a few months.

STREAM-LINE FILTERS LTD
TELEPHONE: MACAULAY 1011
HELE-SHAW WORKS · INGATE PLACE · LONDON · S.W.8

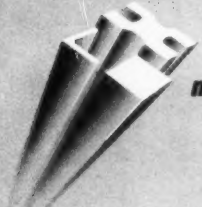
Patent
UNIVERSAL JOINTS
Specified by leading aircraft and engine manufacturers for controls, accessory drives, etc. Made in nine sizes—bored for shafts from ¼" to 1⅜" diameter.

THE MOLLART ENGINEERING CO. LTD.
Kingston-By-Pass, Surbiton, Surrey.
Member of the Gauge and Toolmakers Assoc.
Precision Engineers
Telephone. Elmbridge 3352/3/4
Air Ministry Gauge Test House Authority 5975/51

Printed in Great Britain for the Publishers, ILIFFE & SONS LTD., Dorset House, Stamford Street, London, S.E.1., by CORNWALL PRESS LTD., Paris Garden, London, S.E.1. *Flight* can be obtained abroad from the following: AUSTRALIA AND NEW ZEALAND: Gordon & Gotch, Ltd. INDIA: A. H. Wheeler & Co. CANADA: The Wm. Dawson Subscription Service, Ltd.; Gordon & Gotch, Ltd. SOUTH AFRICA: Central News Agency, Ltd. Wm. Dawson & Sons (S.A.) Ltd. UNITED STATES: The International News Co. Entered as Second Class Matter at the New York, U.S.A., Post Office.

Extrusions in 'Hiduminium'

Because of its easy flow and the fact that it can be extruded with a minimum amount of wear on dies and tools 'Hiduminium' sections can be produced in an almost endless variety of shapes. Following the extrusion process, sections are straightened and checked for trueness in the 250 ton straightening machine shown above. 'Hiduminium' Extrusions enable many industries to



make light work of it with

HIGH DUTY ALLOYS

HIGH DUTY ALLOYS LTD., Slough, Bucks. Telephone: Slough 21201. Ingot, Billets, Forgings, Castings & Extrusions in 'Hiduminium'* and 'Magnuminium',* Aluminium & Magnesium Alloys.

*Registered Trade Marks.

AMBASSADOR

powered by CENTAURUS

The Airspeed Ambassador is fitted with two Centaurus 661 engines, each giving a maximum power of 2700 B.H.P. They have two-speed superchargers, permitting economical operation up to 20,000 ft. and are rated on 100/130 grade fuel, which is universally available. Special attention has been given to providing an exceptional standard of passenger comfort. Engine noise has been much reduced by the special twin rear exhaust manifolds, with outlets discharging over the top of the wing. The inherent balance of the two-row radial is good, but a new type of dynamic flexible mounting attaches the engine to the airframe, to isolate the aircraft completely from any engine vibration. The Ambassador will shortly be in service with B.E.A., and the ample reserve of power will ensure a high degree of safety, with particularly, a single-engine performance which is in excess of official requirements.

THE *Bristol* AEROPLANE COMPANY LIMITED · ENGLAND